Rinnai®

Condensing Tankless Water Heater Service Manual

This manual provides service information for the models below. This table cross references each model to the applicable page number for internal component replacement instructions.

MODELS	DIAGNOSTICS	WIRE DIAGRAM	GAS CONTROL	FAN	PC BOARD	WATER FLOW CONTROL	HEAT EXCHANGER
RC80HPe	9	15	20	22	25	28	31
RC80HPi	9	15	20	22	25	28	34
RC98HPe	11	16	20	22	25	28	37
RC98HPi	11	16	20	22	25	28	40
RU80e	13	17	21	23	27	29	43
RU80i	13	17	21	23	27	29	43
RU98e	13	17	21	23	27	29	43
RU98i	13	17	21	23	27	29	43

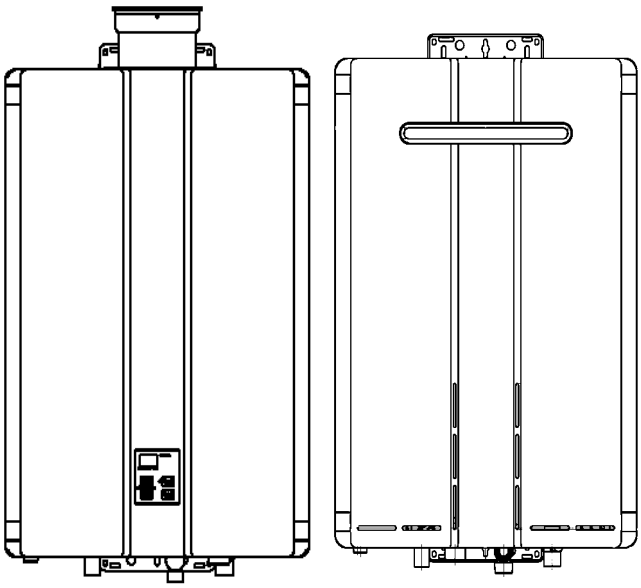
Key to Trade Names in this Manual:

RC & RU-Indicates condensing water heater models.

Some of the trade names for models were changed to indicate that their cartons included isolation valves and a pressure relief valve. For service and repair purposes the table below shows the equivalent models.

Model with valves in carton	Equivalent Model
RC80e	RC80HPe
RC80i	RC80HPi
RC98e	RC98HPe
RC98i	RC98HPi

KA Condensing



KB Condensing

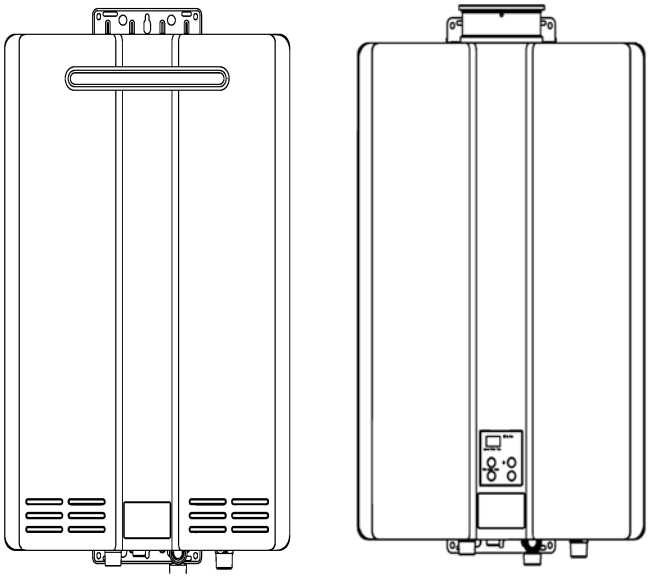


Table of Contents

General Information 3

Specifications 4

Diagnostic Codes 4-8

Safety Warnings 9

Electrical Diagnostic Points
RC80HPe, RC80HPi 10, 11
RC98HPe, RC98HPi 12, 13
RU80e, RU80i, RU98e, RU98i 14, 15

Wire Diagrams
RC80HPe, RC80HPi 16
RC98HPe, RC98HPi 17
RU80e, RU80ic RU98e, RU98i 18

Flushing the Heat Exchanger 19

Manual Draining of the Water Heater 20

Gas Control Assembly
RC80HPe, RC80HPi, RC98HPe, RC98HPi 21
RU80e, RU80i, RU98e, RU98i 22

Fan
RC80HPe, RC80HPi, RC98HPe, RC98HPi 23
RU80e, RU80i, RU98e, RU98i 24, 25

PC Board
RC80HPe, RC80HPi, RC98HPe, RC98HPi 26
RU80e, RU80i, RU98e, RU98i 27

Water Flow Control Assembly
RC80HPe, RC80HPi, RC98HPe, RC98HPi 28
RU80e, RU80i, RU98e, RU98i 29, 30

Heat Exchanger
RC80HPe 31-33
RC80HPi 34-36
RC98HPe 37-39
RC98HPi 40-42
RU80e, RU80ic RU98e, RU98i 43-48

Gas Pressure Setting Procedure
RC80HPe, RC80HPi, RC98HPe, RC98HPi 49, 50
RU80e, RU80i, RU98e, RU98i 52, 53

Manifold Pressure Settings
RC80HPe, RC80HPi, RC98HPe, RC98HPi 51
RU80e, RU80i, RU98e, RU98i 54

Dip Switches
RC80HPe, RC80HPi, RC98HPe, RC98HPi 55
RU80e, RU80i, RU98e, RU98i 56

General Information

Safety Definitions

This is the safety alert symbol. This symbol alerts you to potential hazards that can kill or hurt you and others.

⚠ DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices.

Using this Manual

Repairs should be performed by a qualified service technician.

The following information can be referenced for additional information.

- Operation and Installation Manual
- Hot Water System Design Manual
- Technical Sheets
- Technical Bulletins

Technical Support

Technicians are available to assist in servicing issues. Contact Rinnai Technical Services at 1-888-746-6247.

Recommended Tools

- Volt/Ohm/Amp meter with test probes
- Digital manometer or U tube type manometer with 14 inch water column (W.C.) scale, a hose and two 1/8 inch taps
- assorted wrenches including a 3/16 Allen wrench
- assorted screw drivers
- leak solution or leak detector
- Teflon tape

⚠ WARNING

There are a number of live tests that are required when fault finding this product. Extreme care should be used at all times to avoid contact with energized components inside the water heater. Before checking for resistance readings disconnect the power source to the unit and isolate the item from the circuit (unplug it).

⚠ CAUTION

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation.

If any of the original wire as supplied with the appliance must be replaced, it must be replaced with type 18 AWG wire or its equivalent.

Specifications

Condensing Series - Residential or Commercial - Outdoor

Trade Name	Model	Max. BTU	Min. BTU	Max Flow [1] gal/min (liters/min)	Temperature Range
RC80HPe, RC80e	**REU-KA2530WD-US**	157,000	9,500 (NG) 10,300 (LPG)	8.0 (30)	98 - 140 ºF (37-60 ºC) [2]
RC98HPe, RC98e	**REU-KA3237WD-US**	199,000	9,500 (NG) 10,300 (LPG)	9.8 (37)	
RU80e	**REU-KB2530WD-US**	152,000	15,200	8.0 (30)	
RU98e	**REU-KB3237WD-US**	199,000	15,200	9.8 (37)	

Condensing Series - Residential or Commercial - Indoor

Trade Name	Model	Max. BTU	Min. BTU	Max Flow [1] gal/min (liters/min)	Temperature Range
RC80HPi, RC80i	**REU-KA2530FFUD-US**	157,000	9,500 (NG) 10,300 (LPG)	8.0 (30)	98 - 140 ºF (37-60 ºC) [2]
RC98HPi, RC98i	**REU-KA3237FFUD-US**	199,000	9,500 (NG) 10,300 (LPG)	9.8 (37)	
RU80i	**REU-KB2530FFUD-US**	152,000	15,200	8.0 (30)	
RU98i	**REU-KA3237FFUD-US**	199,000	15,200	9.8 (37)	

[1] Minimum activation flow is approximately 0.4 gallons/minute (1.5 liters/min); minimum flow is approximately 0.26 gallons/minute (1 liter/min).

[2] Max temperature is 185 ºF (85 ºC) with the MCC-91 controller for commercial and hydronic applications only.

Diagnostic Codes

The Rinnai water heater has the ability to check its own operation continuously. If a fault occurs, an error code will flash on the display of the temperature controller. This assists with diagnosing the fault and may enable you to overcome a problem without a service call.

⚠ WARNING

Important Safety Notes

There are a number of (live) tests that are required when fault finding this product. Extreme care should be used at all times to avoid contact with energized components inside the water heater. Only trained and qualified service technicians should attempt to repair this product. Before checking for resistance readings, disconnect the power source to the unit and isolate the item from the circuit (unplug it).

Accessing Operating Information

Models MC-91 and MCC-91 (KA Series)

To display the most recent error codes press and hold the “On/Off” button for 2 seconds. While holding the “On/Off” button press the ▲ button. The last 9 error codes will flash one after the other. To exit this mode press the “On/Off” and ▲ button as before.

To display the water flow through the water heater press and hold the ▲ button for 2 seconds and without releasing the ▲ button press the “On/Off” button.

To display the outlet water temperature press and hold the ▼ button for 2 seconds and without releasing the ▼ button press the “On/Off” button.

Diagnostic Codes

Models MC-91-2 and MCC-91-2 (KB Series)

To display the most recent error codes press and hold the “On/Off” button for 2 seconds. While holding the “On/Off” button press the ▲ button. The last 9 error codes will flash one after the other. To exit this mode press the “On/Off” and ▲ button as before.

To enter or exit the maintenance monitor information mode, press and hold the ▼ button for 2 seconds and without releasing it press the ON/OFF button.

To obtain the water flow rate: press the ▲ or ▼ buttons until “01” displays. The water flow rate will then appear. For example “58” means 5.8 gal/min.

To obtain the outgoing water temperature press the ▲ or ▼ buttons until “02” displays. The temperature will appear in degrees Fahrenheit.

No.	Data	Unit
01	Water flow rate	0.1 gal/min
02	Outgoing water temperature	Degrees Fahrenheit

Operation

1. **Water Flow Begins.**
   - Water Flow Sensor sends pulses to the PC Board.
   - PC Board senses flow.
   - Firing Sequence begins when the flow exceeds the minimum activation flow rate.

2. **Firing Sequence.**
   - PC Board monitors water temperature, temperature set point, and water flow rate.
   - Combustion fan energized. Purges combustion chamber.
   - Spark igniter begins sparking.
   - Gas control valve opens to minimum fire rate.
   - Flame rod(s) proves ignition.
   - Spark igniter stops sparking.

3. **Normal Operation.**
   - PC Board monitors flame rod, fan motor frequency, outlet water temperature, controller temperature set point and water flow rate.
   - Gas control valve modulates gas input to required firing rate.
   - Combustion fan speed is adjusted for the required firing rate.
   - Water flow control valve is adjusted as needed.

4. **Shut-down Sequence.**
   - Shut-down begins when the PC Board senses the minimum flow rate which is 0.26 - 0.5 gpm depending on model.
   - Gas control valve closes.
   - Water flow control valve resets to standby position.
   - Combustion fan runs for a short period of time at low speed.

5. **Standby Mode.**
   - PC Board monitors water temperature and remote controls.
   - Freeze protection is activated as needed.

Diagnostic Codes

Code	Definition	Remedy
03	Power interruption during Bath Fill (Water will not flow when power returns).	Turn off all hot water taps. Press ON/OFF twice.
05	Bypass Servo	Replace Bypass Servo
10	Air Supply or Exhaust Blockage	Ensure Rinnai approved venting materials are being used. Check that nothing is blocking the flue inlet or exhaust. Check all vent components for proper connections. Ensure vent length is within limits. Verify dip switches are set properly. Check fan for blockage. Check burner and heat exchanger fins for obstructions. For condensing models, Burner Sensor Error (see code 31)
11	No Ignition	Check that the gas is turned on at the water heater, gas meter, or cylinder. Ensure gas type and pressure is correct. Ensure gas line, meter, and/or regulator is sized properly. Bleed all air from gas lines. Verify dip switches are set properly. Ensure appliance is properly grounded. Disconnect EZConnect or MSA controls to isolate the problem. Ensure igniter is operational. Check igniter wiring harness for damage. Check gas solenoid valves for open or short circuits. Remove burner cover and ensure all burners are properly seated. Remove burner plate and inspect burner surface for condensation or debris. If flame is visible, check the flame rod circuit.
12	Flame Failure	Check that the gas is turned on at the water heater and gas meter. Check for obstructions in the flue inlet or outlet. Ensure gas line, meter, and/or regulator is sized properly. Ensure gas type and pressure is correct. Bleed all air from gas lines. Ensure Rinnai approved venting materials are used. Ensure vent length is within limits. Verify dip switches are set properly. Ensure appliance is properly grounded. Disconnect keypad. Disconnect EZConnect or MSA controls to isolate the problem. Check power supply for loose connections. Check power supply for proper voltage and voltage drops. Ensure flame rod wire is connected. Ensure flame rod is in proper position (wire should connect at 6 o'clock position for KA series and 12 o'clock position for KB series). Remove flame rod and check for carbon build-up; clean with sand paper or emery cloth. Disconnect and reconnect all wiring harnesses on unit and PC board. Check all components for electrical short. Turn off gas, attempt to fire unit. Should unit have a code 12 there is some form of short occurring. Should the unit have a code 11 there is a combustion issue. Check gas solenoid valves for open or short circuits. Remove burner plate and inspect burner surface and heat exchanger fins for condensation or debris. Check the ground wire for the PC board.
14	Thermal Fuse	Check gas type of unit and ensure it matches gas type being used. Check for restrictions in air flow around unit and vent terminal. Check for low water flow in a circulating system causing short-cycling. Ensure dip switches are set to the proper position. Check for foreign materials in combustion chamber and/or exhaust piping. Check heat exchanger for cracks and/or separations. Check heat exchanger surface for hot spots which indicate blockage due to scale build-up. Refer to instructions in manual for flushing heat exchanger. Hard water must be treated to prevent scale build up or damage to the heat exchanger. Measure resistance of safety circuit. Ensure high fire and low fire manifold pressure is correct. Check for improper conversion of product.

Diagnostic Codes

Code	Definition	Remedy
16	Over Temperature Warning	Check for restrictions in the intake and exhaust system. Check for low water flow in a circulating system causing short-cycling. Check for foreign materials in combustion chamber and/or exhaust piping. Check for blockage in the heat exchanger.
19	Electrical Grounding	Check all components for electrical short.
25	Condensate Trap Error	Condensate container is full. Check condensate drain for blockage. Replace condensate trap.
31	Burner Sensor Error	Measure resistance of sensor. Replace sensor.
32	Outgoing Water Temperature Sensor	Check sensor wiring for damage. Measure resistance of sensor. Clean sensor of scale build-up. Replace sensor.
33	Heat Exchanger Outgoing Temperature Sensor	Check sensor wiring to be sure it has not been short circuited. Measure resistance of sensor. Clean sensor of scale build-up. Replace sensor.
41	Outside Temperature Sensor	Check sensor wiring for damage. Measure resistance of sensor. Clean sensor of scale build-up. Replace sensor.
51	Inlet Water Temperature Sensor	Check sensor wiring for damage. Measure resistance of sensor. Clean sensor of scale build-up. Replace sensor.
52	Modulating Solenoid Valve Signal Abnormal	Check modulating gas solenoid valve wiring harness for loose or damaged terminals. Measure resistance of valve coil.
57	Burner (Bi-Metal sensors / Thermal Fuse Harness)	Check for continuity through bi-metal sensors located at top of heat exchanger at white plastic connector containing red an white wires.
58	Secondary Heat Exchanger	There is scale build-up in the secondary heat exchanger and it needs to be flushed to prevent damage. Refer to the flushing instructions in the manual. Hard water must be treated to prevent scale build-up or damage to the heat exchanger.
61	Combustion Fan Failure	Ensure fan will turn freely. Check wiring harness to motor for damaged and/or loose connections. Measure resistance of motor winding. Check for proper voltage from PC board.
65	Water Flow Control	The water flow control valve has failed to close during the bath fill function. Immediately turn off the water and discontinue the bath fill function. Contact a state qualified or licensed contractor to service the appliance.
70	Sensor Harness Connection	Check PC board switches (in the bank of 6 switches, #2 should be on for indoor models and off for outdoor models on KA series units only) Check the connection harness at the E connection on the PC board. Outdoor models should have 2 orange cables at #7 and 8 positions. Indoor models should not have cables at these positions. If this is incorrect then replace the sensor harness. Replace PC board
71	Solenoid Valve Circuit	Replace PC board.
72	Flame Sensing Device	Verify flame rod is touching flame when unit fires. Check all wiring to flame rod. Remove flame rod and check for carbon build-up; clean with sand paper or emery cloth. Check inside burner chamber for any foreign material blocking flame at flame rod. Measure micro amp output of sensor circuit with flame present. Replace flame rod.

Diagnostic Codes

73	Burner Sensor Circuit	Check sensor wiring and PC board to be sure they have not been damaged. Replace sensor.
79	Water Leakage Detected	Turn off water and gas supply. Disconnect power to the unit. Inspect the unit for leak. Dry area around moisture sensing element.
LC	Scale Build-up in Heat Exchanger (when checking maintenance code history, "00" is substituted for "LC")	Flush heat exchanger. Refer to instructions in manual. Hard water must be treated to prevent scale build up or damage to the heat exchanger. Replace heat exchanger. NOTE: The LC code is the only code that will allow the unit to keep running. The display will alternate between the LC code and the temperature setting. The controller will continue to beep.
FF	Maintenance Performed	Indicates a service provider performed maintenance or repair. Enter this code by pressing up, down, and ON/OFF simultaneously.
No code	Nothing happens when water flow is activated.	**On controller, verify if unit is sensing flow. If not then check the items below. If unit is sensing flow then check the heat exchanger and outlet thermistors.** Clean inlet water supply filter. On new installations ensure hot and cold water lines are not reversed. Check for cold to hot cross over. Isolate circulating system if present. Turn off cold water to the unit, open pressure relief valve; if water continues to flow, there is bleed over in your plumbing. Verify you have at least the minimum flow rate required to fire unit. Verify turbine spins freely. Measure the resistance of the water flow control sensor. If the display is blank and clicking is coming from the unit, disconnect the water flow servo motor. If the display comes on then replace the water flow servo motor.

STOP

DO NOT proceed in performing any electrical diagnostics, service repairs, or component replacements without reading and following the warnings below.

Important Safety Notes

There are a number of (live) tests that are required when fault finding this product. Extreme care should be used at all times to avoid contact with energized components inside the water heater. Only trained and qualified service technicians should attempt to repair this product. Before checking for resistance readings, disconnect the power source to the unit and isolate the item from the circuit (unplug it)

WARNING

Follow the steps below prior to servicing or replacing any component within the tankless water heater in order to protect yourself from harm:

- Turn off the electrical power supply by unplugging the power cord or by turning off the electricity at the circuit breaker. (The temperature controller does not control the electrical power.)
- Turn off the gas at the manual gas valve, usually located immediately below the water heater.
- Turn off the incoming water supply. This can be done at the isolation valve immediately below the water heater or by turning off the water supply to the building.

WARNING

Failure to correctly assemble the components according to the instructions contained within this service manual may result in a gas leak or explosion.

WARNING

Inspect all gaskets/packings for signs of damage or corrosion. Gaskets/packings found to contain damage or that appear questionable **MUST BE REPLACED.** Failure to replace damaged or questionable gaskets may result in gas leak or explosion.

KA Series Electrical Diagnostic Points

RC80HPe, RC80HPi

Heat Exchanger and Outgoing Water Temperature Thermistors:
Check all thermistors by inserting meter leads into each end of the thermistor plug. Set your meter to the 20 K scale and read resistance. Applying heat to the thermistor bulb should decrease the resistance. Applying ice to the thermistor bulb should increase the resistance.

*Example:

140°F = 2.2 ~ 2.7K
221°F = 0.6 ~ 0.8K
59°F = 11.4 ~ 14K
86°F = 6.4 ~ 7.8K
113°F = 3.6 ~ 4.5K

Frost Protection:
This unit has frost protection heaters mounted at different points to protect the water heater from freezing.

Amp Fuses:
This unit has one inline (7) amp glass fuse. Remove the fuse and check continuity through it. If you have continuity through the fuse then it is good. Otherwise the fuse is blown and must be replaced.

Flame Rod:
Place one lead of your meter to the flame rod and the other to ground. With the unit running you should read between 5-150 VAC. Set your meter to the micro amp scale. You should read a minimum of 1 micro amp for proper flame circuit. In the event of low flame circuit remove the flame rod and check for carbon or damage.

COMPONENT	**MEASUREMENT POINT**			**RANGE OF VALUE**
	CN	**PINS**	**WIRE COLOR**	
TEMP CONTROLLER	A	1-3	Bk-Bk	DC10-13V
THERMAL FUSE	B1 pin1 to E1 pin 1		R-R	BELOW 1 Ω
MOD. SOLE. VALVE (POV)	B2 (1-2), B (10-11)		B2: O-O	DC2-15V / 67-82 Ω
MAIN SOLE. VALVE (SV0)	B5 (1-2), B (7-8)		B5: P-Bk	DC11-13V / 37-43 Ω
SOLENOID VALVE 1	B6 (1-2), B (6-7)		B6: B-Bk	
SOLENOID VALVE 2	B7 (1-2), B (5-7)		B7: Y-Bk	
SOLENOID VALVE 3	B3 (1-2), B(4-7)		B3: R-Bk	
SOLENOID VALVE 4	B4 (1-2), B(3-7)		B4: O-Bk	
SURGE PROTECTOR	C1	1-3	Bk-W	AC108-132V
SURGE PROTECTOR	C2	1-3	W-W	
ANTI FROST HEATER	HOT WATER OUTLET LINE			10-20 Ω
	HEAT EXCHANGER PIPING			35-50 Ω
	WATER FLOW SENSOR, HOT WATER OUT-LET, DRAIN CONNECTION			110-150 Ω
	LATENT HEAT EXCHANGER (INDOOR MOD-EL ONLY)			90-110 Ω
IGNITOR	D1	1-2	Gy-Gy	AC108-132V (DURING IGNITION)
HEAT EXCHANGER TH	E2 (1, 2), E(5-10)		W-W	15ºC/59ºF: 11.4-14.0 kΩ 30ºC/86ºF: 6.4-7.8 kΩ 45ºC/113ºF: 3.6-4.5 kΩ 60ºC/140ºF: 2.2-2.7 kΩ 105ºC/221ºF: 0.6-0.8 kΩ
OUTGOING WATER TH1	E3	1-2	W-W	
OUTGOING WATER TH2	E4	3-4	W-W	

KA Series Electrical Diagnostic Points

RC80HPe, RC80HPi

COMPONENT	MEASUREMENT POINT			RANGE OF VALUE
	CN	PINS	WIRE COLOR	
WATER FLOW SENSOR	E5	1-3	R-Bk	DC11-13V
		2-3	Y-Bk	DC4-7V; 1-1.4 MΩ
BYPASS FLOW CONTROL	G1	1-5	Br-W	DC2-6V DURING OPERATION 15-35 Ω
		2-5	O-W	
		3-5	Y-W	
		4-5	R-W	
WATER FLOW CONTROL	G2	3 or 4 - 8	R or P -O	DC5-7V DURING OPERATION
		1 or 2 - 8	B or W -O	
		3-4	R-P	30-50 Ω
		1-2	B-W	
		7-5	Y-Gy	BELOW DC1V (LIMITER ON) DC0-6 (LIMITER OFF)
		7-6	Br-Gy	
COMBUSTION FAN	L1	1-2	R-Bk	DC6-45V
		2-3	Y-Bk	DC11-13V; 3.5-3.9 kΩ
		2-4	W-Bk	DC5-10V; 9.2-9.4 kΩ; (PULSE 20-420 Hz)

KA Series Electrical Diagnostic Points

RC98HPe, RC98HPi

Heat Exchanger and Outgoing Water Temperature Thermistors:

Check all thermistors by inserting meter leads into each end of the thermistor plug. Set your meter to the 20 K scale and read resistance. Applying heat to the thermistor bulb should decrease the resistance. Applying ice to the thermistor bulb should increase the resistance.

Frost Protection:

This unit has frost protection heaters mounted at different points to protect the water heater from freezing.

Amp Fuses:

This unit has one inline (7) amp glass fuse. Remove the fuse and check continuity through it. If you have continuity through the fuse then it is good. Otherwise the fuse is blown and must be replaced.

Flame Rod:

Place one lead of your meter to the flame rod and the other to ground. With the unit running you should read between 5-150 VAC. Set your meter to the micro amp scale. You should read 1 micro amp for proper flame circuit. In the event of low flame circuit remove the flame rod and check for carbon or damage.

COMPONENT	MEASUREMENT POINT			RANGE OF VALUE
	CN	PINS	WIRE COLOR	
TEMP CONTROLLER	B1	1-3	Bk-Bk	DC10-13V
THERMAL FUSE	E1 pin 1 to B1 pin 1		R-W	BELOW 1 Ω
MOD. SOLE. VALVE (POV)	B2	1-2	O-O	DC2-15V / 67-81 Ω
MAIN SOLE. VALVE (SV0)	B3	1-2	P-Bk	DC11-13V / 24-28 Ω
SOLENOID VALVE 1	B4	1-2	Bl-Bk	DC11-13V / 37-43 Ω
SOLENOID VALVE 2	B5	1-2	Y-Bk	
SOLENOID VALVE 3	B6	1-2	R-Bk	
SOLENOID VALVE 4	B7	1-2	O-Bk	
SURGE PROTECTOR	C1	1-3	Bk-W	AC108-132V
SURGE PROTECTOR	C2	1-3	W-W	
ANTI FROST HEATER	HOT WATER OUTLET LINE			180-207 Ω
	HEAT EXCHANGER PIPING			156-180 Ω
	WATER FLOW SENSOR			24-28 Ω
IGNITOR	D1	1-2	Gy-Gy	AC90-110V (DURING IGNITION)
HEAT EXCHANGER TH	E2	1-2	W-W	15ºC/59ºF: 11.4-14.0 kΩ 30ºC/86ºF: 6.4-7.8 kΩ 45ºC/113ºF: 3.6-4.5 kΩ 60ºC/140ºF: 2.2-2.7 kΩ 105ºC/221ºF: 0.6-0.8 kΩ
OUTGOING WATER TH1	E4 pins 3,4 to E8 pins 1-2		W-W	

KA Series Electrical Diagnostic Points

RC98HPe, RC98HPi

COMPONENT	MEASUREMENT POINT			RANGE OF VALUE
	CN	PINS	WIRE COLOR	
WATER FLOW SENSOR	F2	1-3	R-Bk	DC11-13V; 5.5-6.2 kΩ
		2-3	Y-Bk	DC4-7V; 1-1.4 MΩ
BYPASS FLOW CONTROL	G1	1-5	Br-W	DC2-6V DURING OPERATION 15-35 Ω
		2-5	O-W	
		3-5	Y-W	
		4-5	R-W	
WATER FLOW CONTROL	G2	3 or 4 - 8	R or P -O	DC5-7V DURING OPERATION
		1 or 2 - 8	B or W -O	DC5-7V DURING OPERATION
		3-4	R-P	30-50 Ω
		1-2	B-W	30-50 Ω
		7-5	Y-Gy	BELOW DC1V (LIMITER ON) DC0-6 (LIMITER OFF)
		7-6	Br-Gy	BELOW DC1V (LIMITER ON) DC0-6 (LIMITER OFF)
COMBUSTION FAN	E1	1-2	R-Bk	DC6-45V
		2-3	Y-Bk	DC11-13V; 3.5-3.9 kΩ
		2-4	W-Bk	DC5-10V; 9.2-9.4 kΩ; (PULSE 20-420 Hz)

KB Series Electrical Diagnostic Points

RU80i/e, RU98i/e

Heat Exchanger, Outgoing Water Temperature and Inlet Thermistors:
Check all thermistors by inserting meter leads into each end of the thermistor plug. Set your meter to the 20 K scale and read resistance. Applying heat to the thermistor bulb should decrease the resistance. Applying ice to the thermistor bulb should increase the resistance. See below for examples of typical temperatures and resistance readings.

*Example:
140°F = 2.2 ~ 2.7K
221°F = 0.6 ~ 0.8K
59°F = 11.4 ~ 14K
86°F = 6.4 ~ 7.8K
113°F = 3.6 ~ 4.5K

Flame Rod:
Place one lead of your meter to the flame rod and the other to ground. With the unit running you should read between 5-150 VAC. Set your meter to the µ amp scale and series your meter in line with the flame rod. You should read 1 µ amp or greater for proper flame circuit. In the event of low flame circuit remove the flame rod and check for carbon or damage.

Frost Protection:
This unit has frost protection heaters mounted at different points to protect the water heater from freezing. All of them should show a positive resistance reading.

Amp Fuses:
This unit has one inline (10) amp glass fuse. Remove the fuse and\ check continuity through it. If you have continuity through the fuse then it is good. Otherwise the fuse is blown and must be replaced.

(SV1, SV2, SV3 and POV) Gas valve and Modulating solenoids: (Set meter below 2K)

Wire Color	Voltage	Resistance	Connector #	Pin #'s
(Main) Black - Pink	11 ~ 13 VDC	24 ~ 28 ohms	B1	3 - 4
(SV1) Black - Blue	11 ~ 13 VDC	35 ~ 41 ohms	B3	4 - 6
(SV2) Black - Yellow	11 ~ 13 VDC	35 ~ 41 ohms	B2	4 - 7
(SV3) Black - Red	11 ~ 13 VDC	39 ~ 42 ohms	B4	4 - 5
(POV) Yellow - Yellow	2 ~ 15 VDC	67 ~ 81 ohms	D4	1 - 2

(M) Water Flow Control Device Servo or Geared Motor:

Red - Pink	5 ~ 8 VDC	24 ~ 28 ohms	G2	3 - 4
White - Blue	5 ~ 8 VDC	35 ~ 41 ohms	G2	1 - 2
Grey - Brown	N/A	N/A	G2	5 - 7
Grey - Orange	N/A	N/A	G2	6 - 7

NOTE: The grey wire listed above turns to black at G connector on the PCB.

KB Series Electrical Diagnostic Points

RU80i/e, RU98i/e

(QS) Water Flow Sensor:

Wire Color	Voltage	Resistance	Connector #	Pin #'s
Black - Red	11 ~ 13 VDC	5.5 ~ 6.2 K ohms	L3	E10 - G7
Yellow - Black	4 ~ 7 VDC	1 ~ 1.4 Mega ohms	B3	4 - 6

By-Pass Flow Control:

Red - Pink	2 ~ 6 VDC	44 ~ 52 ohms	G1	12 - 13
Yellow - Black	2 ~ 6 VDC	44 ~ 52 ohms	G1	10 - 11

(IG) Ignition System:

Grey - Grey	90 ~ 110 VAC	N/A	C1	1 - 3

(FM) Combustion Fan Motor:

Red - Black	6 ~ 45 VDC	N/A	L2	5 - 6
White - Black	5 ~ 10 VDC	9.72 ~ 9.75 K ohms	L2	3 - 5
Yellow - Black	11 ~ 13 VDC	4.02 ~ 4.05 K ohms	L2	4 - 5

Set your meter to the hertz scale. Reading across the white and black wires at terminals 3 and 5 you should read between 60 and 420 hertz.

Thermal Fuse / Overheat Switch:

Red - White	11 ~ 13 VDC	Below 1 Ohms	B8 B7	B1 - G8

Outgoing Water Thermistor:

White - White	N/A	*See example on page 11	E6	2 - 3
Blue - Blue	N/A	*See example on page 11	E6	4 - 5

Heat Exchanger Temperature Thermistor:

Pink - Pink	N/A	*See example on page 11	E5	4 - 7

Inlet Thermistor:

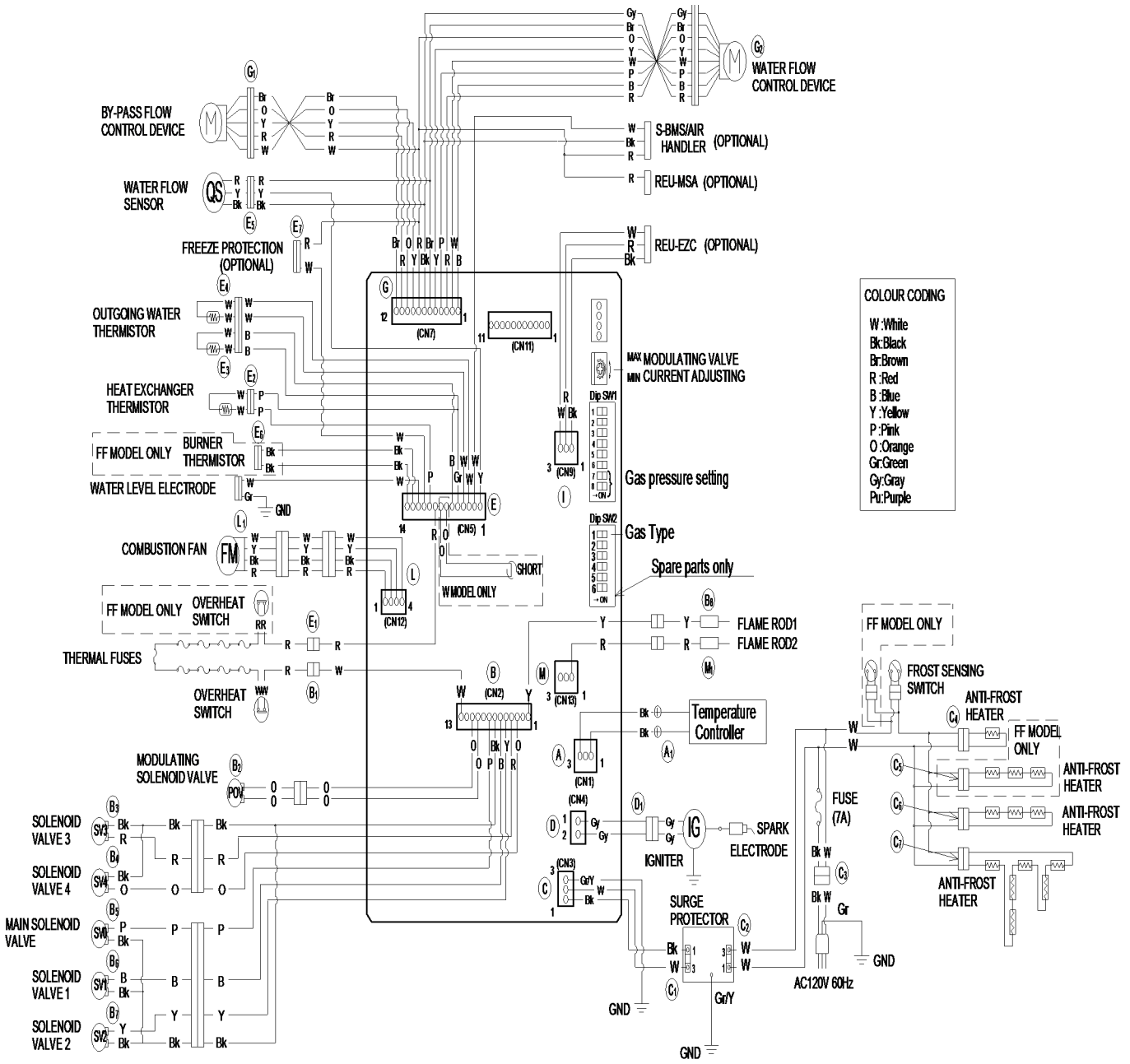
White - White	N/A	*See example on page 11	E9	4 - 9

Remote Control:

Terminals J	10 ~ 13 VDC	1.5 ~ 3.0 K ohms	J	1 - 2

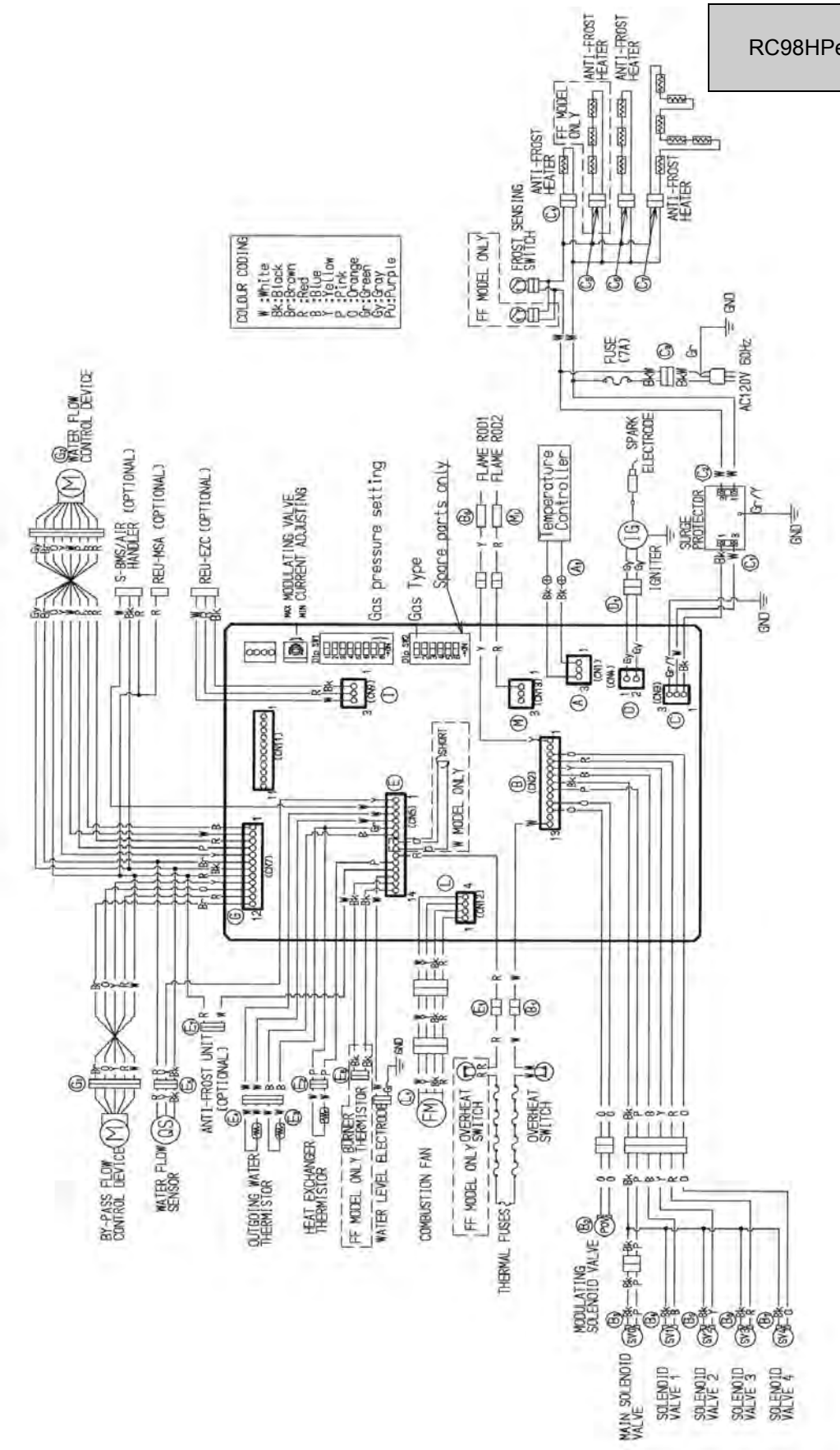
KA Series Wiring Diagram

RC80HPe, RC80HPi



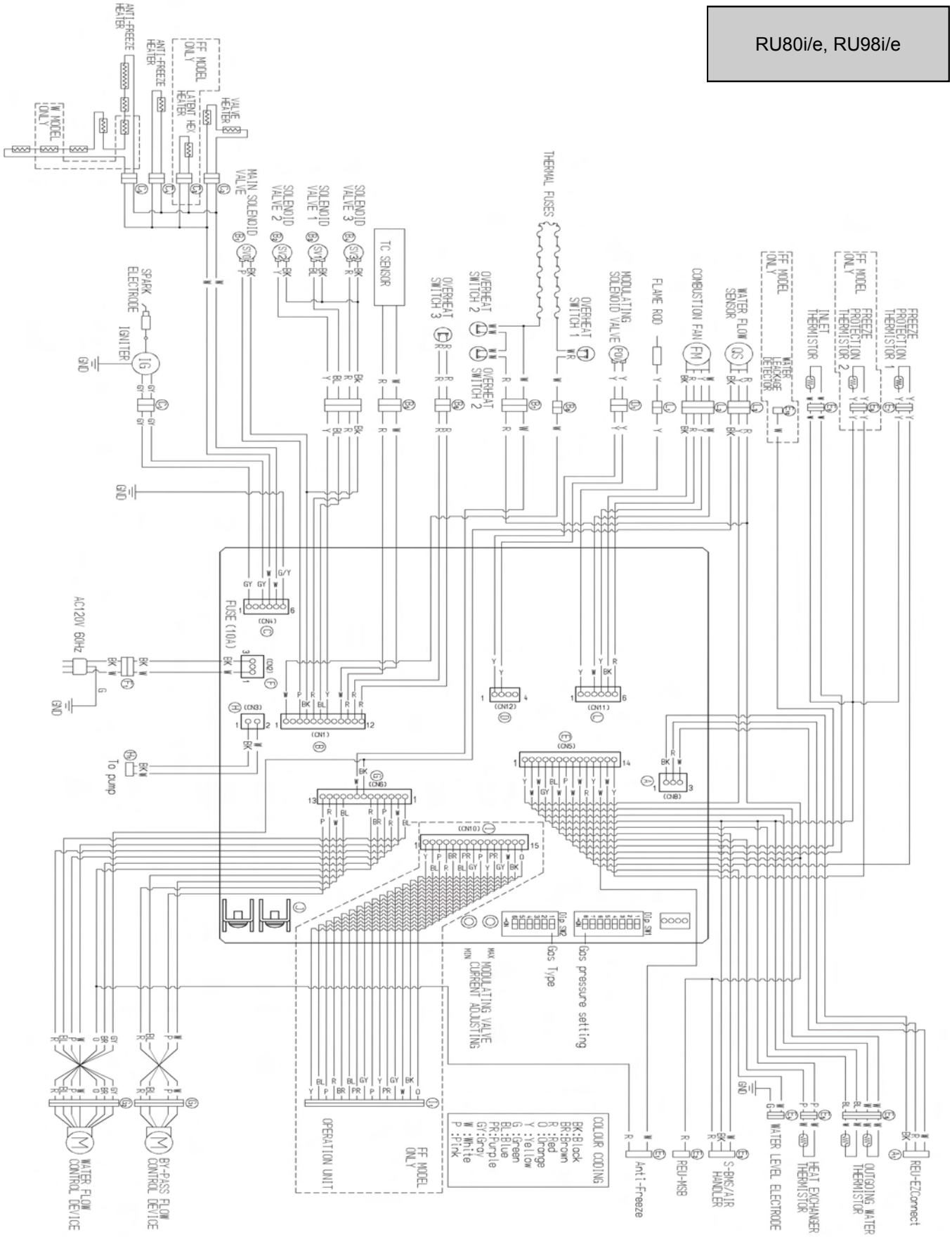
KA Series Wiring Diagram

RC98HPe, RC98HPi



KB Series Wiring Diagram

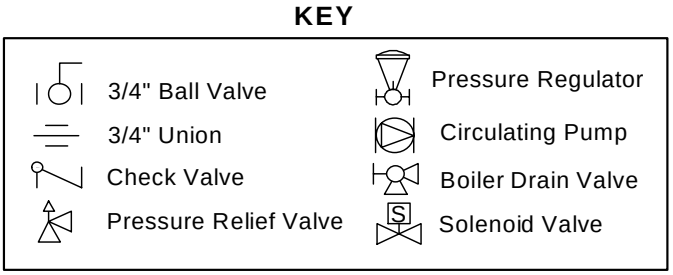
RU80i/e, RU98i/e

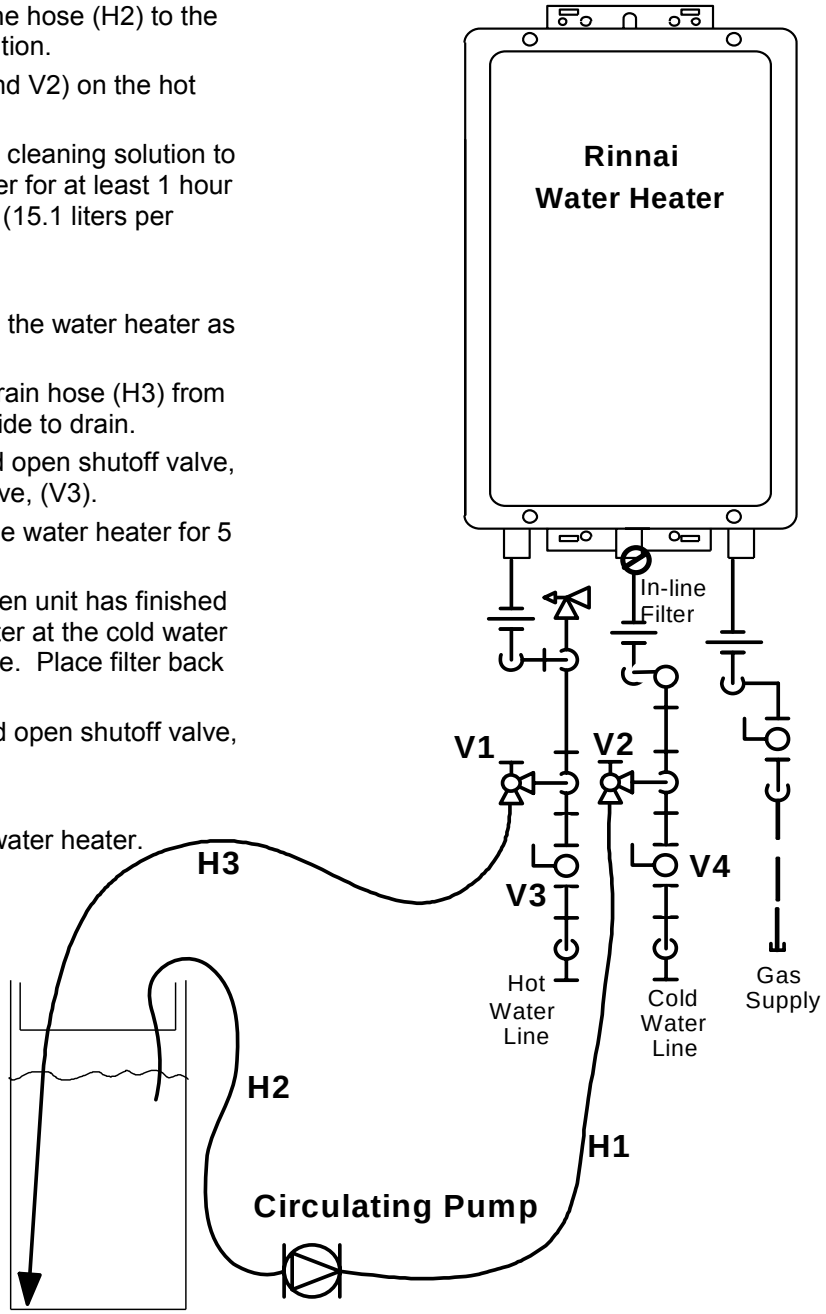


Flushing the Heat Exchanger

An “LC” or “00” error code indicates the unit is beginning to lime up and must be flushed. Failure to flush the appliance will cause damage to the heat exchanger. Damage caused by lime build-up is not covered by the unit’s warranty. After flushing, reset the LC fault code by turning off the power to the unit and turning the power back on.

1. Disconnect electrical power to the water heater.
2. Close the shutoff valves on both the hot water and cold water lines (V3 and V4).
3. Connect pump outlet hose (H1) to the cold water line at service valve (V2).
4. Connect drain hose (H3) to service valve (V1).
5. Pour 4 gallons of undiluted virgin, food grade, white vinegar into pail.
6. Place the drain hose (H3) and the hose (H2) to the pump inlet into the cleaning solution.
7. Open both service valves (V1 and V2) on the hot water and cold water lines.
8. Operate the pump and allow the cleaning solution to circulate through the water heater for at least 1 hour at a rate of 4 gallons per minute (15.1 liters per minute).
9. Turn off the pump.
10. Rinse the cleaning solution from the water heater as follows:
    a. Remove the free end of the drain hose (H3) from the pail. Place in sink or outside to drain.
    b. Close service valve, (V2), and open shutoff valve, (V4). Do not open shutoff valve, (V3).
    c. Allow water to flow through the water heater for 5 minutes.
    d. Close shutoff valve (V4). When unit has finished draining remove the in-line filter at the cold water inlet and clean out any residue. Place filter back into unit and open valve (V4).
    e. Close service valve, (V1), and open shutoff valve, (V3).
11. Disconnect all hoses.
13. Restore electrical power to the water heater.





Manual Draining of the Water Heater

⚠ WARNING To avoid burns, wait until the equipment cools down before draining the water. The water in the appliance will remain hot after it is turned off.

If the water heater is not going to be used during a period of possible freezing weather, it is recommended that the water inside the water heater be drained.

To manually drain the water:

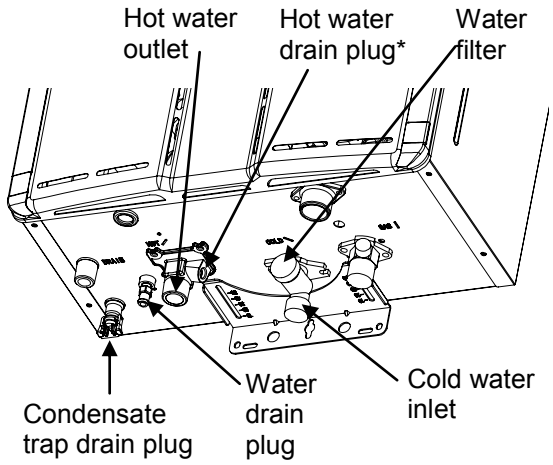
1. Shut off cold water supply, hot water valve and gas supply.
2. Turn off the temperature controller.
3. Disconnect the power to the water heater.
4. Remove the drain caps on both isolation valves and open both valves above the caps (blue and red valve handles). -OR- Open hot water drain plug at the hot water outlet.
5. Remove water filter to drain the cold water.
6. Unscrew the water drain plug from the drain line next to the hot water outlet and remove the condensate trap drain plug. Allow to drain.

To resume normal operation:

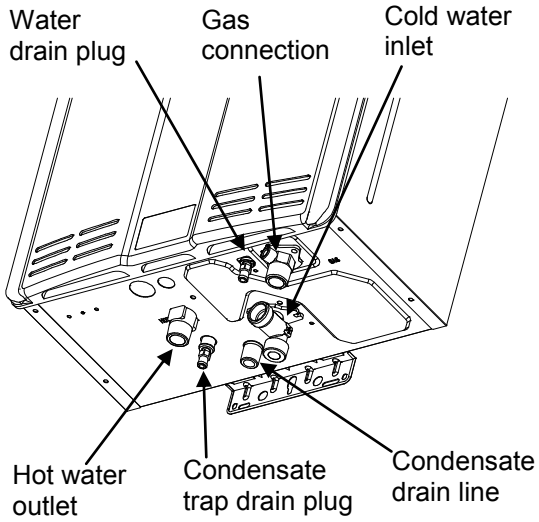
1. Confirm that all water drain plugs are removed, that the gas supply is turned off, and that all taps are closed.
2. Insert the condensate trap drain plug and screw in the water drain plug.
3. Screw in the water filter in the cold water inlet.
4. Replace the drain caps and close both isolation valves. -OR- Screw in the hot water drain plug.
5. Open the cold water supply and hot water valve.
6. Open a tap and confirm that water flows, and then close.
7. Turn on the power.
8. After confirming that the temperature controller is off, turn on the gas supply.
9. Turn on the temperature controller.

* Use a wrench or other tool to unscrew the hot water drain plug.

(KA Series)



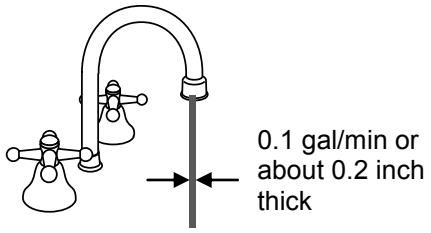
(KB Series)



Running a low volume of water through the water heater to prevent freezing

If the temperature exceeds the ability of the water heater to freeze protect itself, or if power is lost, the following steps may prevent the water heater and external piping from freezing. (Units connected with EZConnect™ should be drained to prevent freezing if not in use.)

1. Turn the water heater off.
2. Close the gas supply valve.
3. Turn on a hot water tap to flow water about 0.1 gal/min or where the stream is about 0.2 inches thick.



When the water heater or external piping has frozen

1. Do not operate the water heater if it or the external piping is frozen.
2. Close the gas and water valves and turn off the power.
3. Wait until the water thaws. Check by opening the water supply valve.
4. Check the water heater and the piping for leaks.

Gas Control Assembly

RC80HPi, RC80HPe,
RC98HPi, RC98HPe

1. Turn off gas supply.
2. Turn off water supply.
3. Turn off 120v power supply.
4. Remove four screws securing the front panel. Remove front panel.

Remove controller assembly (indoor model only)

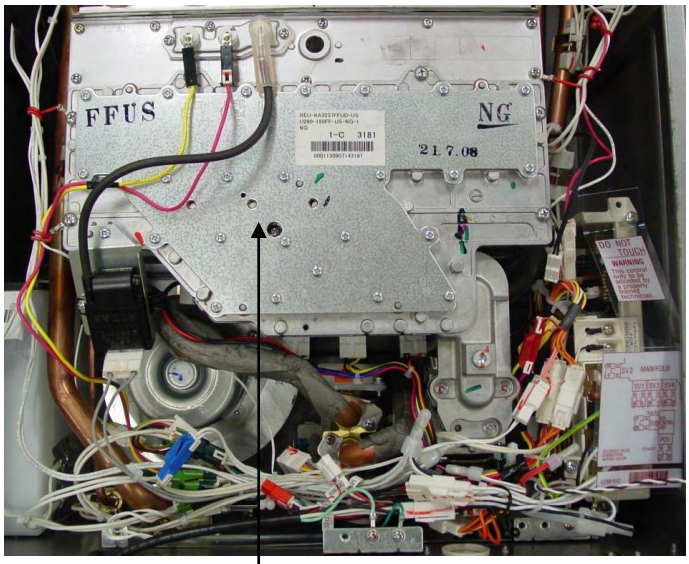
5. Remove temperature controller. Remove two screws for temperature controller bracket. Remove bracket.

Remove gas manifold and gas valve

6. Disconnect high tension cord from electrode. Remove one screw for igniter bracket. Remove bracket from manifold.
7. Disconnect flame rod wires. (yellow and red)
8. Remove seven pan head screws from manifold (six screws outer edge, one screw in middle) and three machine screws, at bottom of manifold, to gas valve.
9. Disconnect the four solenoid wire harnesses at bottom of manifold. Remove manifold plate.
10. Remove the three screws attaching the gas connection to the bottom side of water heater.
11. Pull the gas connection down to disconnect it from the gas control assembly.
12. Pull out the gas control assembly. Remove the two solenoid wire harnesses.

Install gas valve and gas manifold

13. Install the gas control assembly and connect the wire harness to the two solenoids.
14. Install the gas connection with three screws.
15. Replace the circular gasket (included in kit) in the gas valve. Ensure that the ribbed side faces outward.
16. Remove packing from manifold. Install new packing from kit to the gas manifold.
17. Connect the four solenoid wire harnesses at the bottom of the manifold. Install igniter bracket with one screw to gas manifold. Connect high tension cord to electrode.



Manifold

18. Start the three screws that attach the gas manifold to the gas valve. Install and tighten the seven screws that hold the gas manifold to the combustion chamber. Tighten the three screws that hold the gas manifold to the gas valve.

Install temperature controller assembly (indoor model only)

19. Install temperature controller bracket with two screws. Install temperature controller.

Testing and close up

20. Calibrate low and high fire manifold pressure settings. See pages 49-50.
21. Install the front panel using four screws.

Gas Control Assembly

RU80i/e, RU98i/e

⚠ WARNING

To protect yourself from harm, before performing maintenance:

- Turn off the electrical power supply by unplugging the power cord or by turning off the electricity at the circuit breaker. (The temperature controller does not control the electrical power.)
- Turn off the gas at the manual gas valve, usually located immediately below the water heater.
- Turn off the incoming water supply. This can be done at the isolation valve immediately below the water heater or by turning off the water supply to the building.

1. Disconnect the electrical power.
2. Turn off the gas supply.
3. Remove 4 screws securing the front panel. Remove front panel. For indoor models, remove the controller bracket.
4. Remove 2 screws from the retainer clip securing gas line that connects gas valve to manifold assembly. (FIGURE 1)
5. Rotate retainer clip to release the gas line. (FIGURE 2)
6. Disconnect the gas line from the gas valve, ensure the o-ring remains intact. (FIGURE 2)
7. Disconnect POV solenoid wire harness. (YL/YL wired connection on rear of gas valve). (FIGURE 2)
8. Disconnect SV0 main solenoid wire harness (PK/BK wired connection on front of gas valve). (FIGURE 2)
9. Remove 3 screws from inlet gas connection on bottom of unit. (FIGURE 3)
10. Install new gas valve and inlet gas connection in place using 3 screws. (FIGURE 3)
11. Connect POV (YL/YL wired connection rear of gas valve), and SV0 (PK/BK wired connection front of gas valve) wire harnesses to the gas valve. (FIGURE 2)
12. Connect gas line pipe onto gas valve. Rotate clip onto gas line pipe join to the gas valve. (FIGURE 2)
13. Secure the retainer clip into place using 2 screws. (FIGURE 1)
14. Calibrate low and high fire manifold pressure settings. See Pages 52-54.
15. Install the front panel using four screws.

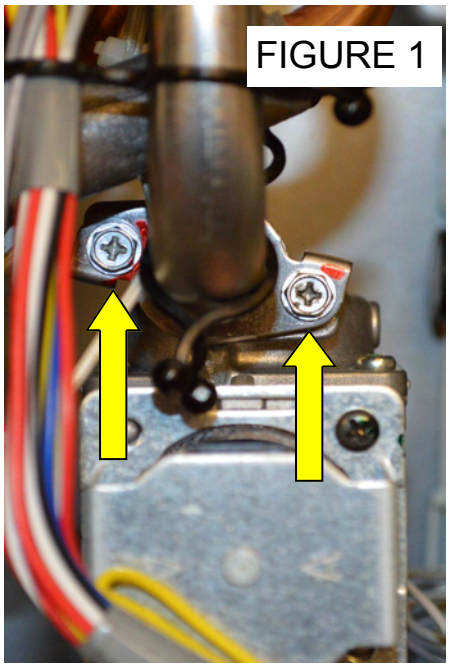


FIGURE 1

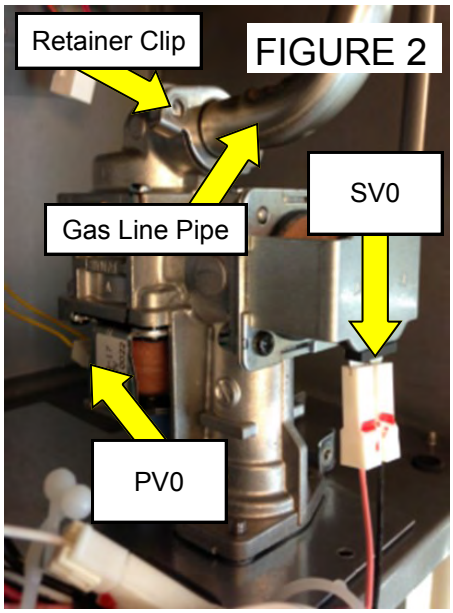


FIGURE 2

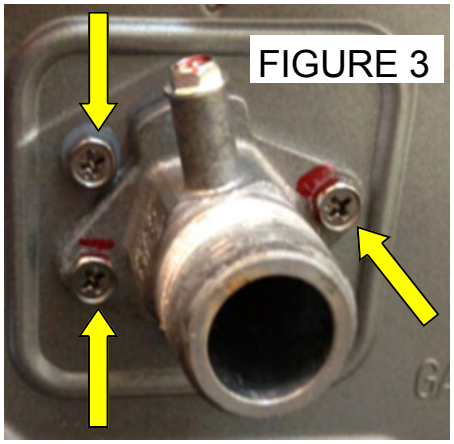


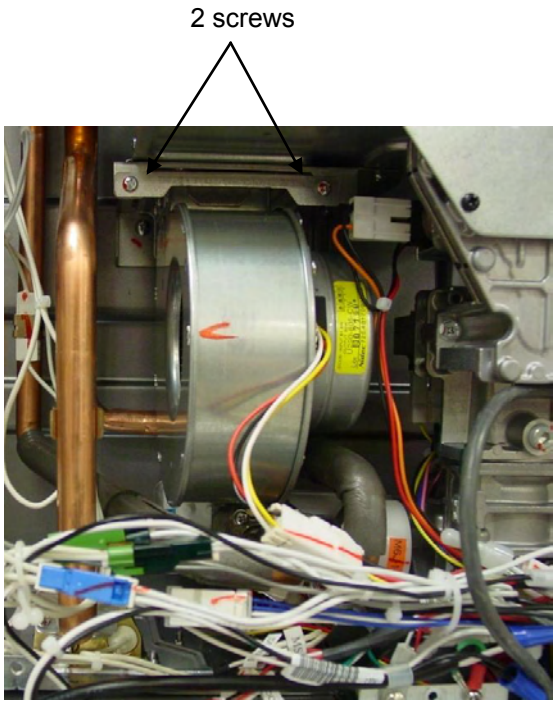
FIGURE 3

KA Series Component Replacement Instructions

Fan

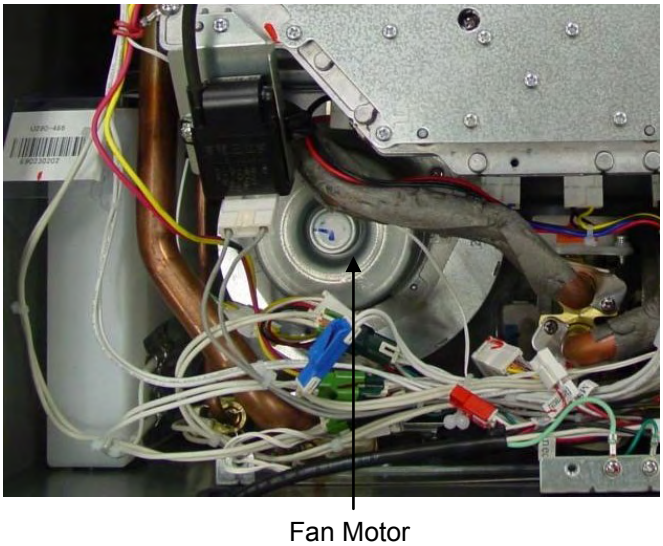
RC80HPe, RC80HPi

1. Turn off gas supply.
2. Turn off water supply.
3. Turn off 120v power supply.
4. **(Indoor model only)** Remove temperature controller. Remove two screws for temperature controller bracket. Remove bracket.
5. Disconnect fan harness connector (white, yellow, black, red).
6. Remove two screws at top of fan assembly.
7. Remove fan assembly.
8. Install new fan assembly.
9. Reinstall two screws at top of fan assembly.
10. Reconnect fan harness connector (white, yellow, black, red).
11. **(Indoor model only)** Reinstall temperature controller bracket with two screws. Install temperature controller in bracket.
12. Turn on 120v power. Turn on water supply. Turn on gas supply.



RC98HPe, RC98HPi

1. Turn off gas supply.
2. Turn off water supply.
3. Turn off 120v power supply.
4. **(Indoor model only)** Remove temperature controller. Remove two screws for temperature controller bracket. Remove bracket.
5. Disconnect high tension cord from electrode. Remove one screw for igniter module bracket. Remove igniter bracket from gas manifold.
6. Disconnect fan harness connector (white, yellow, black red).
7. Remove three screws and lock washers to fan motor.
8. Remove fan motor from housing between the copper pipes.
9. Install fan motor. Ensure fan motor is clocked correctly for harness connector.
10. Reinstall three screws and lock washers to fan motor.
11. Reinstall igniter module bracket to gas manifold with one screw. Install high tension cord to electrode.
12. **(Indoor model only)** Reinstall temperature controller bracket with two screws. Install temperature controller in bracket.
13. Turn on 120v power. Turn on water supply. Turn on gas supply.



Combustion Fan Motor

RU80i/e, RU98i/e

1.Turn off the gas supply.

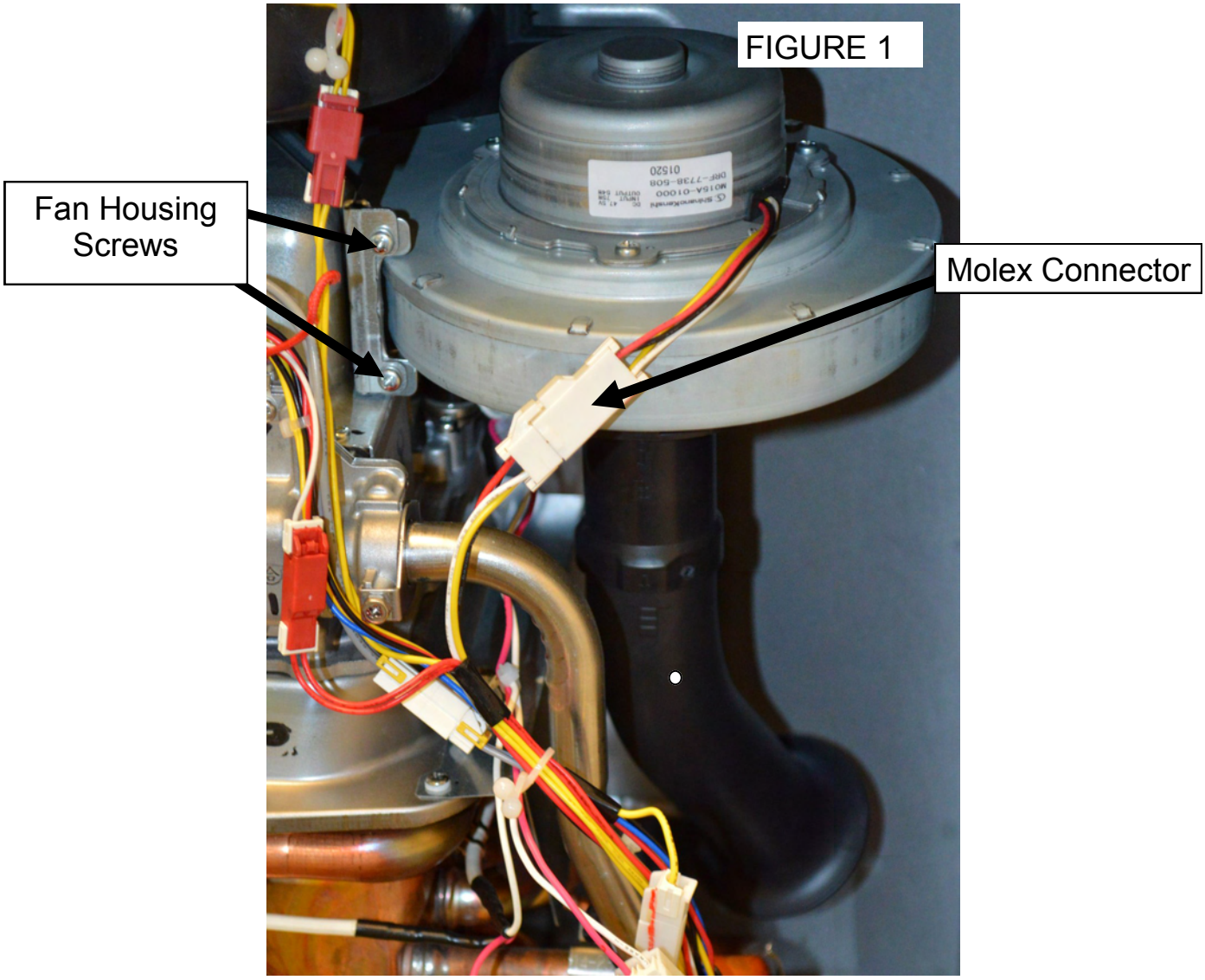
2.Turn off the 120 V power supply.

3.Remove four screws securing the front panel. Remove front panel.

4.Remove 2 screws from fan housing. (FIGURE 1)

5.Unplug Molex connector from fan motor. (FIGURE 1)

6.Remove fan motor from unit rotating it out clockwise.



Combustion Fan Motor

RU80i/e, RU98i/e

7.Remove 3 screws securing tube connector to fan motor. (FIGURE 2)

8.Install new fan motor.

9.Install tube connector using 3 screws. (FIGURE 2)

10.Connect Molex connector to fan motor harness. (FIGURE 1)

11.Install fan housing using 2 screws. (FIGURE 1)

12.Install front panel using 4 screws.

13.Turn on water supply, power supply, and gas supply.

14.Install the front panel using four screws.

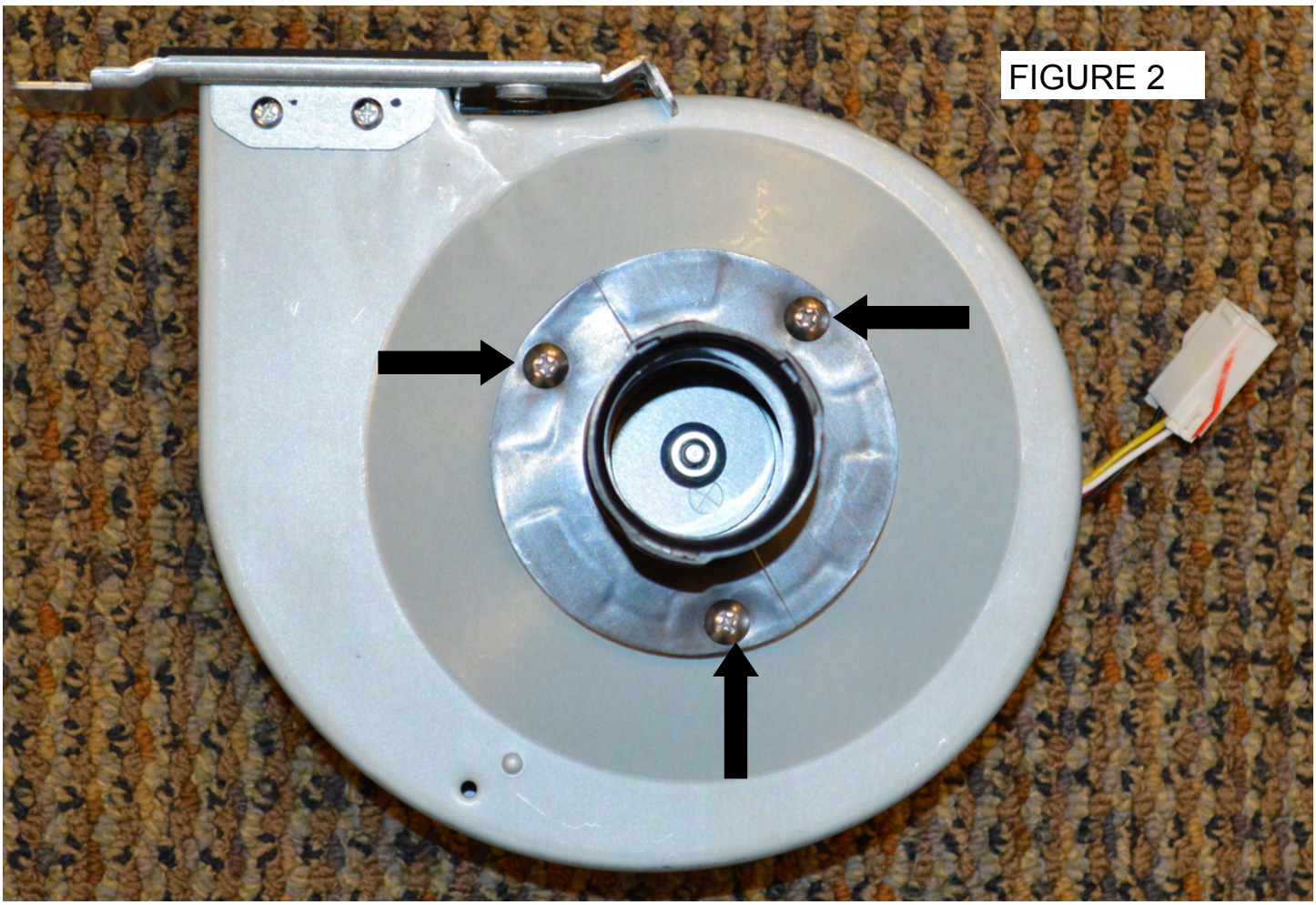
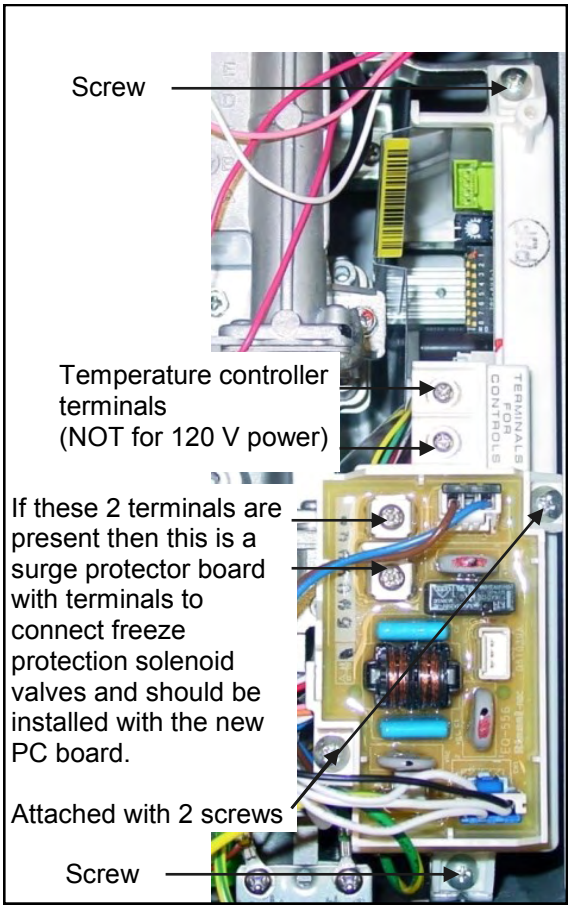


FIGURE 2

PC Board

RC80HPe, RC80HPi, RC98HPe, RC98HPi

1. Turn off the gas supply.
2. Turn off the 120 V power supply.
3. Turn off the water supply.
4. Remove four screws securing the front panel. Remove front panel.
5. Lift up the plastic guard covering the front of the PC board.
6. Remove the controller connections and the two ground wires at the bottom of the cabinet.
7. If a surge protector with terminals is installed, then remove this board by removing two screws. This board should be re-installed on the replacement PC board.
8. Remove the two screws at the top and bottom of the PC board.
9. Pull out the PC board, remove plastic cover, and remove the connections.
10. Adjust dip switches on the new PC board. (Refer to page 55.)
11. Attach connections and plastic cover.
12. Insert PC board and attach with two screws.
13. Attach connections for the temperature controller.
14. Attach plastic guard.
15. Install two ground wires at the bottom of the cabinet.
16. Perform the Gas Pressure Setting Procedure. (Refer to pages 49-51)


Screw
Temperature controller terminals (NOT for 120 V power)
If these 2 terminals are present then this is a surge protector board with terminals to connect freeze protection solenoid valves and should be installed with the new PC board.
Attached with 2 screws
Screw

KB Series Component Replacement Instructions

PC Board

RU80i/e, RU98i/e

1.Turn off 120v power supply.

2.Turn off gas supply.

3.Turn off water supply.

4.Remove the four screws securing the front panel. Remove front panel.

SW1 Tan Switches	
1	ON for short vent length* OFF for long vent length and outdoor models*
2	See altitude table
3	
4	OFF* (Air Handler)
5	OFF* (Fixed Temperature without controller - 120°F/140°F)
6	OFF* (Max temperature - 120°F/140°F)
7	OFF* (Units in standby with EZConnect™)
8	OFF

SW2 White Switches	
1	OFF for Propane Gas ON for Natural Gas
2	OFF* (Optional Temperature table)
3	OFF* (Optional Temperature table)
4	OFF* (Recirculation - pump)
5	OFF
6	ON for RU80 OFF for RU98
7	OFF
8	OFF* (Recirculation - insulation)

5.Remove two screws connecting the PC board to the cabinet of the water heater.

6.Pull out PC board and remove the connectors.

7.Adjust the dip switches on the new PC board (see below).

8.Install PC board attaching all connections. Secure with two screws.

9.Calibrate the low and high fire pressure settings. (Reference the section **KB Series Gas Pressure Setting Procedure** and **KB Series Manifold Gas Pressure Settings**).

Altitude	**Dip Switch #2**	**Dip Switch #3**
0-2000 ft (0-610 m)	OFF	OFF
2001-5200 ft (610-1585 m)	OFF	ON
5201-7700 ft (1585-2277 m)	ON	OFF
7701-10200 ft (2277-3109 m)	ON	ON

*** These are specific for the water heater installation. Copy the settings on the old PC Board or refer to the manual for details on these switch settings. Default is OFF.**

Water Flow Control Assembly

RC80HPe, RC80HPi,
RC98HPe, RC98HPi

1. Turn off gas supply.
2. Turn off water supply. Drain all water from appliance.
3. Turn off 120v power supply.
4. Remove four screws securing the front panel. Remove front panel.

Remove controller assembly (indoor models only)

5. Remove temperature controller. Remove two screws for temperature controller bracket. Remove bracket.

Remove water flow servo valve

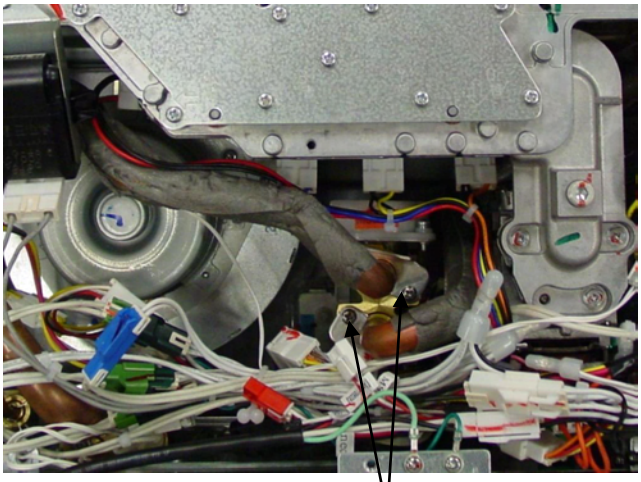
6. Remove two screws and brackets at the bypass valve. Remove two copper tubes.
7. Remove four screws attaching the water inlet to the bottom of the water heater cabinet.
8. Disconnect the wire harnesses (water flow sensor harness - black, yellow, red wires; bypass servo assembly harness - white, red, yellow, orange, brown wires, water flow servo valve harness - gray, brown, orange, yellow, white, pink, blue, red). Remove heating element.
9. Pull out the water flow servo assembly and bypass servo assembly.
10. Remove two screws in order to separate the bypass servo assembly from the water flow servo assembly.

Reinstall water flow servo valve

11. Replace the O-ring (included in kit) between the water flow servo assembly and the bypass servo assembly. Attach the new water flow servo assembly to the bypass assembly with two screws.
12. Place inside the heater and attach the wire harnesses. Install heating element.
13. Replace the O-ring on the water inlet (included in kit). Attach the water flow assembly to the water inlet using four screws. The two shorter screws can be installed first to connect the water flow assembly to the bottom of the cabinet. Then install the two longer screws through the water inlet.
14. Replace the O-ring on the water lines (included in kit). Attach the two water lines to the bypass valve, with one bracket and one screw for each line.

Install controller assembly (indoor models only)

15. Install temperature controller bracket with two screws. Install temperature controller.
16. Turn on the water supply, power supply, and gas supply.



Water flow servo assembly connections

17. Open hot water tap and ensure there are no leaks at the water heater.
18. Install front panel using four screws.

KB Series Component Replacement Instructions

Water Flow Control Assembly & By-Pass Control Assembly

RU80i/e, RU98i/e

1.Disconnect the electrical power.

2.Turn off the gas supply.

3.Turn off water supply. Drain all water from the appliance.

4.Remove 4 screws securing the front panel. Remove front panel. For indoor models, remove the controller bracket.

5.Remove 2 screws securing inlet fixture as well as the 1 screw to the right of the inlet fixture. Pull fixture away from unit (ensure fixture o-ring is intact). (FIGURE 1)

6.Remove the 2 screws from By-Pass valve retainer clips as well as the screw holding in the ceramic anti-frost heater to the valve assembly. (FIGURE 2)

7.Disconnect the following harnesses: By-Pass Valve (WT/PK/BL/RD), Water Flow Sensor (RD/BK/YL), and Water Flow Control Valve (GY/BR/OR/WT/PK/BL/RD).

8.Remove the Water Flow Servo and By-pass Valve assemblies. *(A small amount of water may still be present be sure not to let water come into contact with electrical components)* (FIGURE 3)

FIGURE 1

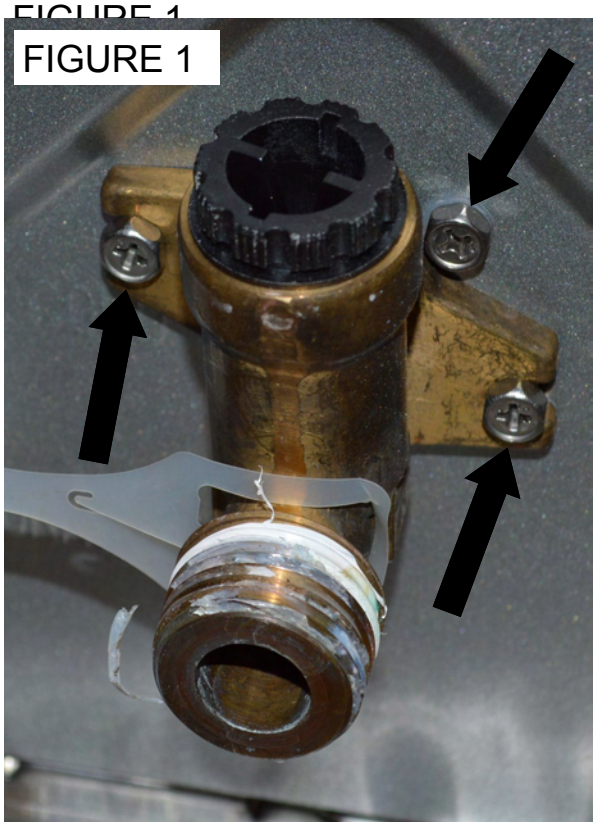


FIGURE 2

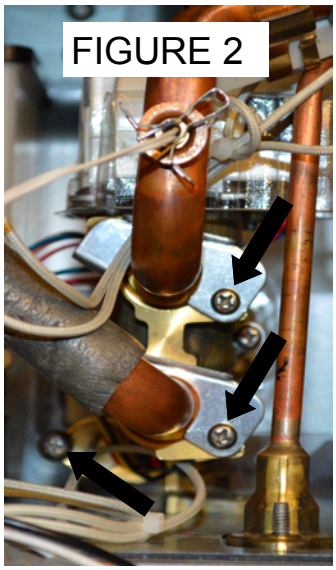
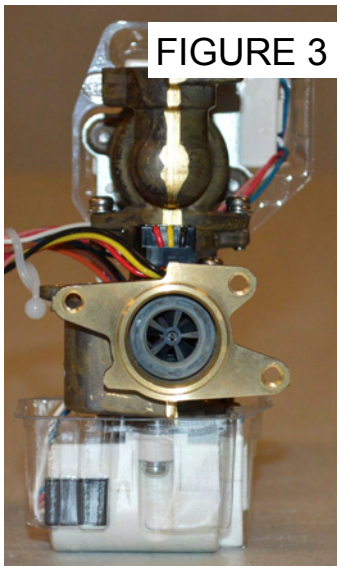
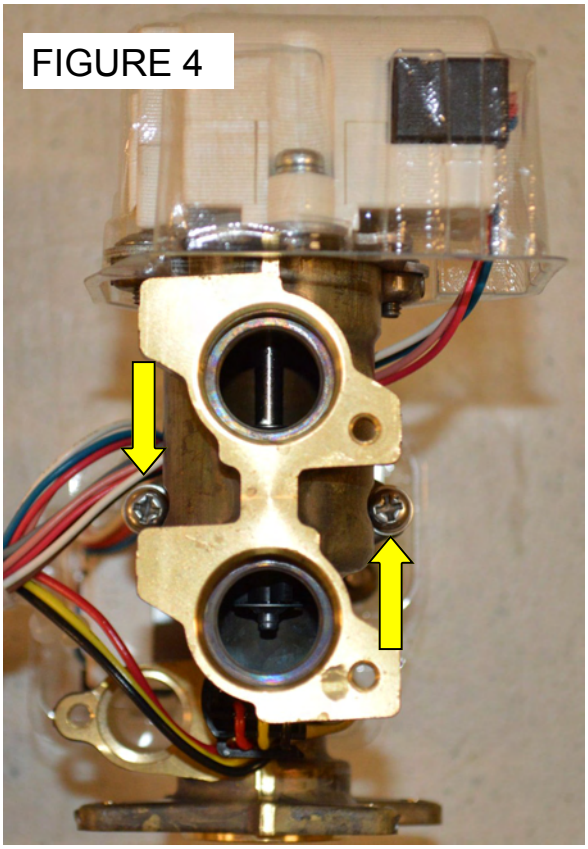


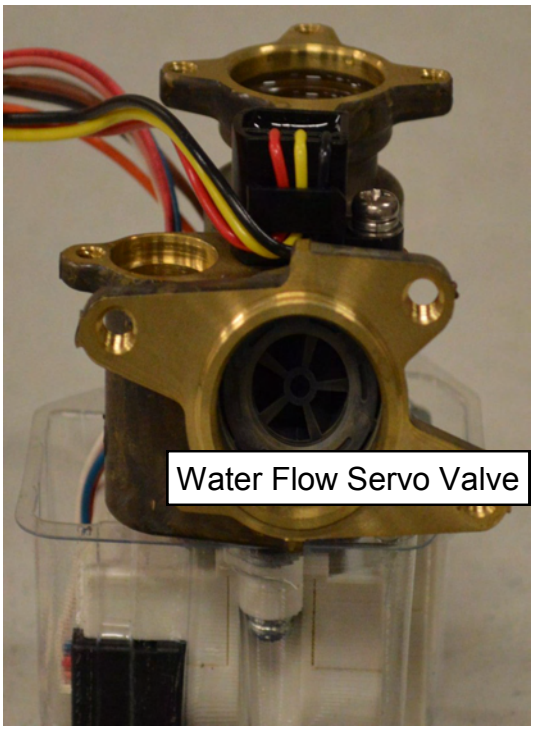
FIGURE 3

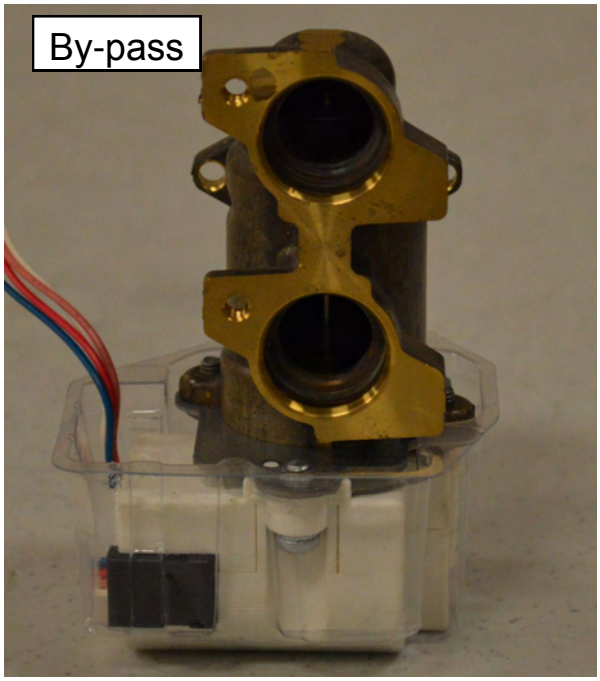


Wire Colors
Black-BK, Blue-BL, Brown-BR, Grey-GY, Orange-OR, Pink-Pink, Red-RD, White-WT, Yellow-YL

9. Separate the Water Flow Servo Valve from the By-Pass Valve by removing 2 screws. (FIGURE 4)
10. Attach the new Water Flow Servo Valve to the By-pass Valve using the 2 screws. (FIGURE 4)
11. Reinstall the Water Flow Servo Valve assembly.
12. Reconnect the following harnesses: By-Pass Valve (WT/PK/BL/RD), Water Flow Sensor (RD/BK/YL), and Water Flow Control Valve (GY/BR/OR/WT/PK/BL/RD).
13. Attach the By-Pass Valve retainer clips using 2 screws (1 screw per clip) as well as the 1 screw to hold in the ceramic anti-frost heater to the valve assembly (FIGURE 2)
14. Reinstall the inlet fixture using 2 screws as well as the 1 screw to the right of inlet fixture. (FIGURE 1)
15. For indoor models, reinstall the controller bracket and controller. Replace the front panel. Reinstall 4 screws securing the front panel.
16. Turn on the gas supply.
17. Turn on water supply.
18. Reconnect the electrical power.
19. Open a hot water tap and ensure there are no leaks at the water heater.







Component Replacement Instructions

Heat Exchanger

RC80HPe

These instructions are for replacing the lower (primary) heat exchanger or the upper (secondary) heat exchanger.

1. Turn off gas supply.
2. Turn off water supply. Drain all water from the appliance.
3. Turn off 120V power supply.
4. Remove four screws securing the front panel. Remove front panel.

Remove gas manifold

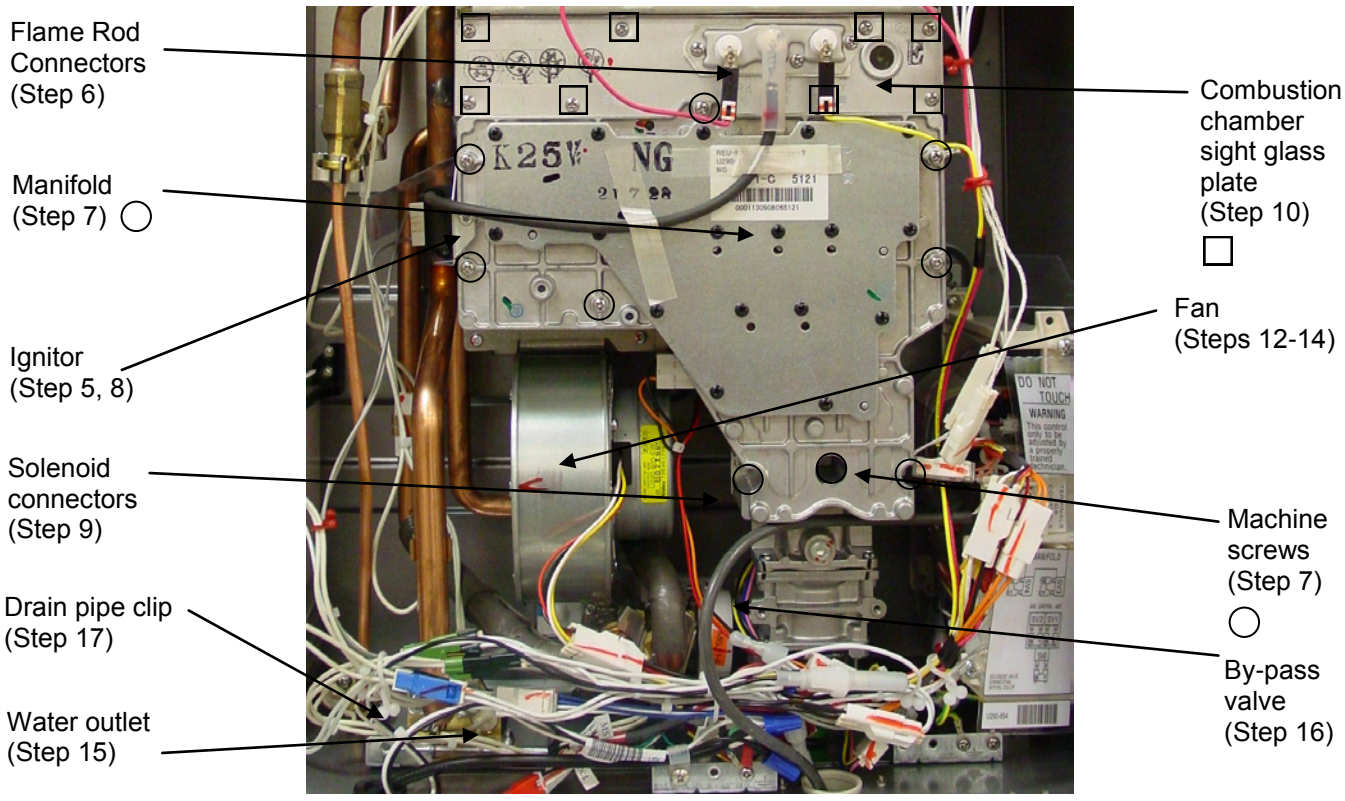
5. Disconnect high tension cord from electrode.
6. Disconnect flame rod wires. (yellow and red)
7. Remove the three machine screws where manifold meets gas valve. Then remove six screws from manifold.
8. Disconnect ignitor module harness, mounted on manifold. (gray/gray)
9. Disconnect the two solenoid wire harnesses at bottom of manifold. Remove manifold plate.
10. Remove eight screws for the combustion chamber sight glass plate. Remove plate.
11. Remove two screws attaching the burner to the heat exchanger. Pull out the burner.

Remove fan

12. Disconnect fan harness.
13. Remove two screws from fan assembly.
14. Remove fan.

Disconnect water lines

15. Remove one screw from hot water line bracket. Remove bracket by rotating and moving it up toward the bend in the tube where the diameter is smaller.
16. Remove two screws and two brackets at by-pass valve assembly.
17. Remove clips from drain connecting pipe. Remove drain connecting pipe.


Flame Rod Connectors (Step 6)
Manifold (Step 7) ◯
Ignitor (Step 5, 8)
Solenoid connectors (Step 9)
Drain pipe clip (Step 17)
Water outlet (Step 15)
Combustion chamber sight glass plate (Step 10) □
Fan (Steps 12-14)
Machine screws (Step 7) ◯
By-pass valve (Step 16)

18. Disconnect condensate tube from upper heat exchanger.

Disconnect wire harnesses

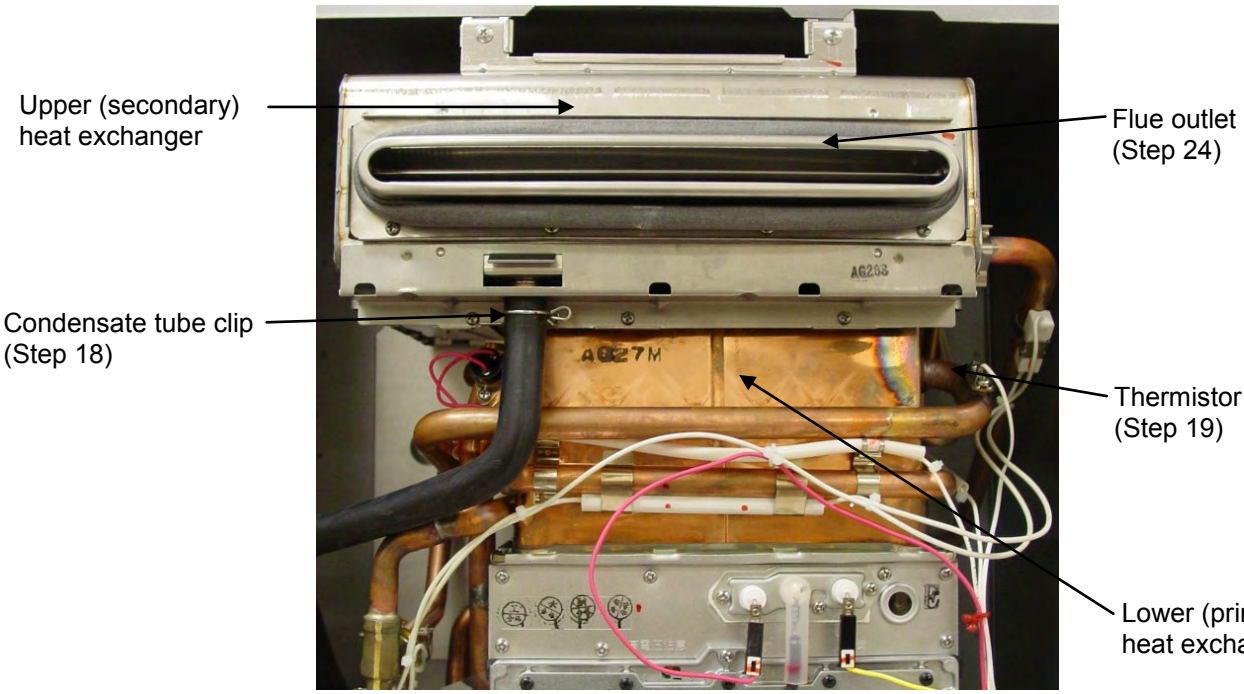
19. Disconnect heat exchanger thermistor (upper right).
20. Disconnect anti frost heater connector at bottom of cabinet. One blue connector.
21. Disconnect thermal fuse harnesses (lower right). Two single white wire connectors.

Remove heat exchanger

22. Remove three screws at bottom of heat exchanger. Remove two screws at top back of heat exchanger. Remove two screws at top on reinforcement bracket for upper heat exchanger.
23. Remove heat exchanger assembly.
24. **If replacing the upper (secondary) heat exchanger,** remove clips from two upper heat exchanger copper pipes. Disconnect pipes. Remove eight screws from flue outlet assembly. Discard screws.
    Remove two screws from reinforcement bracket. Discard screws.
25. Remove three screws on front where upper and lower heat exchangers meet. Discard screws. Turn heat exchanger over; remove six screws on back where upper and lower heat exchangers meet. Discard screws. Separate the upper heat exchanger from the lower heat exchanger.

Installation

26. Install new gasket from kit onto the upper heat exchanger. (Remove the old gasket if the upper heat exchanger is not new.) Attach upper heat exchanger to lower heat exchanger with new screws from kit. (six screws on back, three screw on front)
27. **If replacing lower (primary) heat exchanger,** transfer wiring from old heat exchanger to new heat exchanger. Ensure proper routing of harnesses. These include thermal fuse, bi-metal, heat exchanger thermistor, and ceramic heaters.
28. Transfer parts from old heat exchanger to new heat exchanger.
29. **If replacing the upper (secondary) heat exchanger,** install connecting pipe to upper heat exchanger and copper tee with new o-ring and clip; and connecting pipe between upper heat exchanger and bypass valve with new o-ring and clip.
    Install the flue outlet assembly (8 screws) and the reinforcement bracket (2 screws).


Upper (secondary) heat exchanger
Flue outlet (Step 24)
Condensate tube clip (Step 18)
Thermistor (Step 19)
Lower (primary) heat exchanger

30. Install heat exchanger assembly in case. Place bottom in cabinet first. Attach with five screws. (two at top back and three on bottom). Attach reinforcement bracket with two screws.

Install water and drain lines

31. Install drain connecting pipe with new o-rings and attach with new clips.
32. Attach connecting pipe to by-pass valve with one screw and bracket. Attach other water line with one screw and bracket.
33. Attach the hot water outlet line to the hot water outlet fitting with one screw and bracket. Reconnect condensate tube to upper heat exchanger.

Reconnect wire harness

34. Reconnect heat exchanger thermistor (upper right).
35. Reconnect anti frost connector at bottom of cabinet. One blue connector.
36. Reconnect thermal fuse harnesses (lower right). Two single white wire connectors.

Install burner and burner cover plate

37. Install burner assembly with two screws. Remove combustion chamber packing on sight glass plate. Install new packing, in kit, on sight glass plate. Install combustion chamber sight glass plate with eight screws.

Install fan

38. Reinstall fan with two screws. Install fan connector.

Install gas manifold

39. Remove packing from gas control assembly. Discard. Install new packing, in kit, on gas control assembly.
40. Remove the packing for manifold. Install new packing, in kit, on gas manifold.
41. Reconnect the two solenoid wire harnesses at bottom of manifold.
42. Reconnect ignitor module harness, mounted on manifold. (gray/gray)
43. Attach the gas manifold with three machine screws at the gas control assembly. Install six screws on gas manifold to heat exchanger. Attach wire harness ties.

Reconnect flame rod connectors and electrode

44. Install two flame rod connectors. (marked)
45. Attach ignitor high tension cord to the electrode.
46. Turn on water supply, power supply, and gas supply. Check for gas and water leaks. Perform operational checks.
47. Install the front panel using four screws.

KA Series Component Replacement Instructions

Heat Exchanger

RC80HPi

These instructions are for replacing the lower (primary) heat exchanger or the upper (secondary) heat exchanger.

1. Turn off gas supply.
2. Turn off water supply. Drain all water from the appliance.
3. Turn off 120V power supply.
4. Remove four screws securing the front panel. Remove front panel.

Remove controller assembly

5. Remove temperature controller. Remove two screws for temperature controller bracket. Remove bracket.

Remove gas manifold

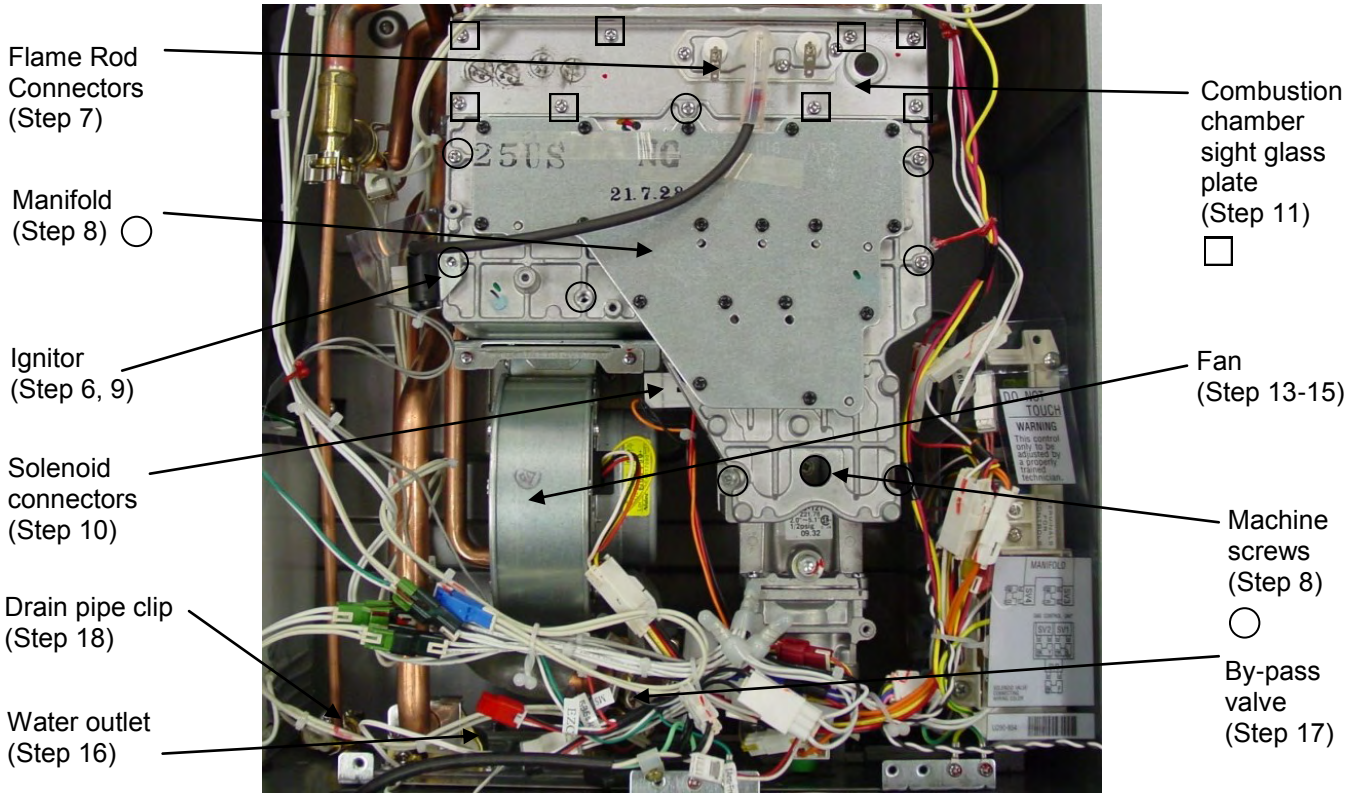
6. Disconnect high tension cord from electrode.
7. Disconnect flame rod wires. (yellow and red)
8. Remove three machine screws where manifold meets the gas valve, then remove six screws from the manifold.
9. Disconnect ignitor module harness, mounted on manifold. (gray/gray)
10. Disconnect the two solenoid wire harnesses at bottom of manifold. Remove manifold plate.
11. Remove eight screws for the combustion chamber sight glass plate. Remove plate.
12. Remove two screws attaching the burner to the heat exchanger. Pull out the burner.

Remove fan

13. Disconnect fan harness.
14. Remove two screws from fan assembly.
15. Remove fan.

Disconnect water lines

16. Remove one screw from hot water line bracket. Remove bracket by rotating and moving it up toward the bend in the tube where the diameter is smaller.
17. Remove two screws and two brackets at by-pass valve assembly.
18. Remove clips from drain connecting pipe. Remove drain connecting pipe.


Flame Rod Connectors (Step 7)
Manifold (Step 8) ◯
Ignitor (Step 6, 9)
Solenoid connectors (Step 10)
Drain pipe clip (Step 18)
Water outlet (Step 16)
Combustion chamber sight glass plate (Step 11) □
Fan (Step 13-15)
Machine screws (Step 8) ◯
By-pass valve (Step 17)

19. Disconnect condensate tube from upper heat exchanger.

Disconnect wire harnesses

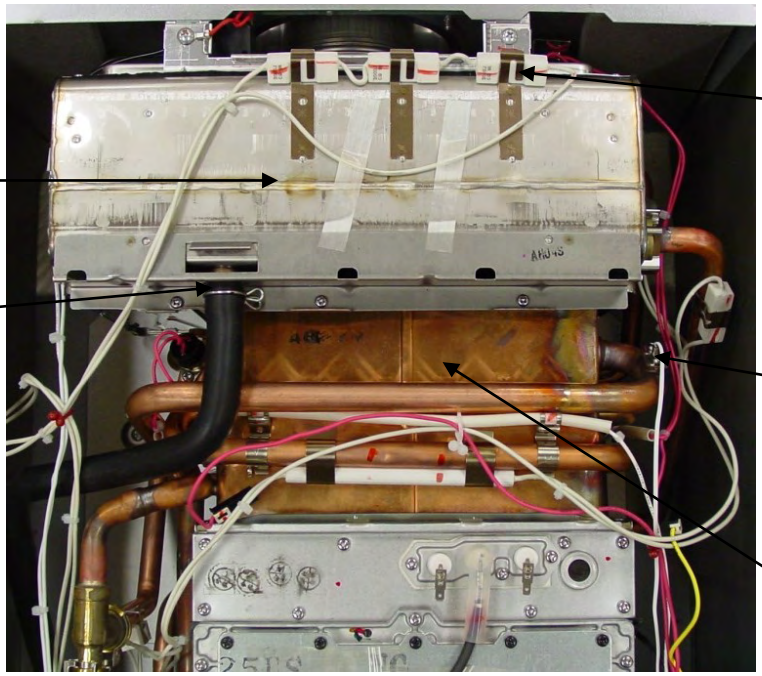
20. Disconnect heat exchanger thermistor (upper right).
21. Remove three anti frost heaters from clips at top of heat exchanger.
22. Disconnect anti frost heater connectors at bottom of cabinet. One blue connector.
23. Disconnect burner sensor harness (lower right).
24. Disconnect thermal fuse harnesses (lower right). Two single white wire connectors.

Remove heat exchanger

25. Remove three screws at bottom of heat exchanger. Remove two screws at top back of heat exchanger. Remove two screws at top on reinforcement bracket for upper heat exchanger.
26. Remove four screws for flue connection assembly. Remove flue connection.
27. Remove heat exchanger assembly.
28. Remove clips and connecting pipe between upper heat exchanger and copper tee on left side.
29. Remove three screws on front where upper and lower heat exchangers meet. Discard screws. Turn heat exchanger over; remove six screws on back where upper and lower heat exchangers meet. Discard screws. Separate the upper heat exchanger from the lower heat exchanger.
30. **If replacing the upper (secondary) heat exchanger,** then remove fourteen screws to separate it from the air inlet box assembly. Discard screws and remove air inlet box assembly. Remove the old gasket from the air inlet box assembly. Install new gasket from kit. Attach air inlet box assembly with new screws (fourteen) from kit. Ensure reinstallation of reinforcement bracket on top of air inlet box assembly.

Installation

31. Install new gasket from kit onto the upper heat exchanger. (Remove the old gasket if the upper heat exchanger is not new.) Attach upper heat exchanger to new lower heat exchanger with new screws from kit. (six screws on back, three screw on front)
32. **If replacing the lower (primary) heat exchanger,** transfer wiring from old heat exchanger to new heat exchanger. Ensure proper routing of harnesses. These include burner sensor with new gasket, thermal fuse, bi-metal, ceramic heaters.


Upper (secondary) heat exchanger
Condensate tube clip (Step 19)
Anti frost heaters/clips (Step 21)
Thermistor (Step 20)
Lower (primary) heat exchanger

33. **If replacing the lower (primary) heat exchanger,** transfer parts from old heat exchanger to new heat exchanger. These include connecting pipe between upper heat exchanger and copper tee with new o-rings and clips, connecting pipe between upper heat exchanger and bypass valve with new o-ring and clip.
34. Install heat exchanger assembly in case. Place bottom in cabinet first. Attach with five screws. (two at top back and three on bottom) Attach reinforcement bracket with two screws.
35. Remove old gasket from flue connection assembly. Install new gasket from kit. Attach flue connections assembly with four screws.

Install water and drain lines

36. Install drain connecting pipe with new o-rings and attach with new clips.
37. Attach water inlet connecting pipe with new o-rings at by-pass valve with one screw and bracket. Attach other water line with one screw and bracket.
38. Attach the hot water outlet line to the hot water outlet fitting with one screw and bracket. Reconnect condensate tube at upper heat exchanger.

Reconnect wire harness

39. Reconnect heat exchanger thermistor (upper right).
40. Install three anti frost heaters in clips at top of upper heat exchanger.
41. Reconnect anti frost connectors at bottom of cabinet. One blue connector.
42. Reconnect burner sensor harness (lower right).
43. Reconnect thermal fuse harnesses (lower right). Two single white wire connectors.

Install burner and burner cover plate

44. Install burner assembly with two screws. Remove combustion chamber packing on sight glass plate. Install new packing, in kit, on sight glass plate. Install combustion chamber sight glass plate with eight screws.

Install fan

45. Reinstall fan with two screws. Install fan connector.

Install gas manifold

46. Remove packing from gas control assembly. Discard. Install new packing, in kit, on gas control assembly.
47. Remove the packing for manifold. Install new packing, in kit, on gas manifold.
48. Reconnect ignitor module harness, mounted on manifold. (gray/gray)
49. Install two connectors to the solenoids on the gas manifold. (marked)
50. Attach the gas manifold with three machine screws at the gas control assembly. Install six screws on gas manifold to heat exchanger. Attach wire harness ties.

Reconnect flame rod connectors and electrode

51. Install two flame rod connectors. (marked)
52. Attach ignitor high tension cord to the electrode.
53. Attach controller bracket with one machine screw and one screw from power wire clamp. Install controller in bracket.
54. Turn on water supply, power supply, and gas supply. Check for gas and water leaks. Perform operational checks.
55. Install the front panel using four screws.

Heat Exchanger

RC98HPe

These instructions are for replacing the lower (primary) heat exchanger or the upper (secondary) heat exchanger.

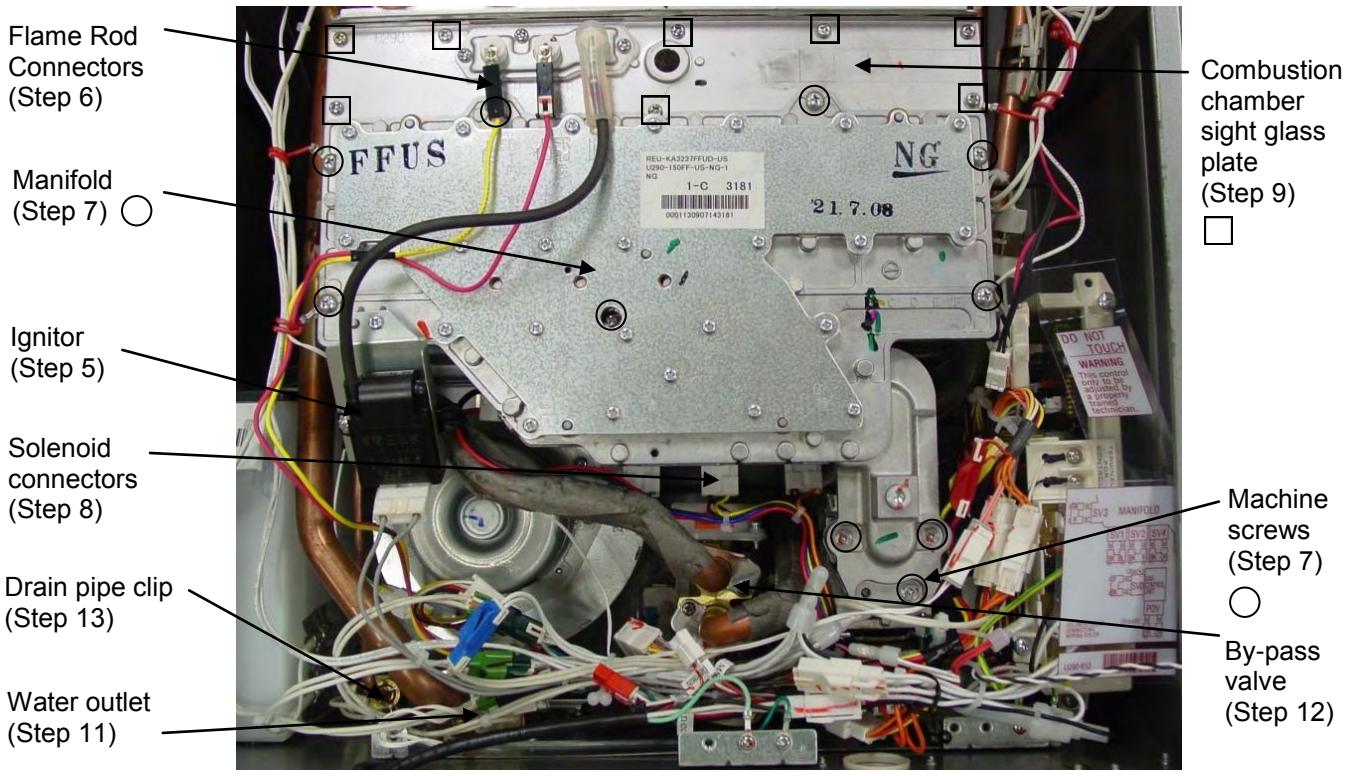
1. Turn off gas supply.
2. Turn off water supply. Drain all water from the appliance.
3. Turn off 120V power supply.
4. Remove four screws securing the front panel. Remove front panel.

Remove gas manifold

5. Disconnect high tension cord from electrode. Remove one screw for ignitor bracket. Remove ignitor bracket from manifold.
6. Disconnect flame rod connectors. (yellow and red)
7. Remove seven pan head screws from manifold (six screws on the outer edge, one screw in middle), and three machine screws, at bottom of manifold, to gas valve.
8. Disconnect the four connectors from the solenoids at bottom of manifold. Remove manifold plate.
9. Remove eight screws for the combustion chamber sight glass plate. Remove plate.
10. Remove two screws attaching the burner to the heat exchanger. Pull out the burner.

Disconnect water lines

11. Remove one screw from hot water line bracket. Remove bracket by rotating and moving it up toward the bend in the tube where the diameter is smaller.
12. Remove two screws and two brackets at by-pass valve assembly.
13. Remove lower clip from drain connecting pipe.
14. Remove the clip on the heat exchanger inlet pipe on the right side of heat exchanger. Remove the two anti frost heaters from pipe. Remove heat exchanger inlet pipe.
15. Disconnect condensate tube from upper heat exchanger.



Heat Exchanger

RC98HPe

Disconnect wire harnesses

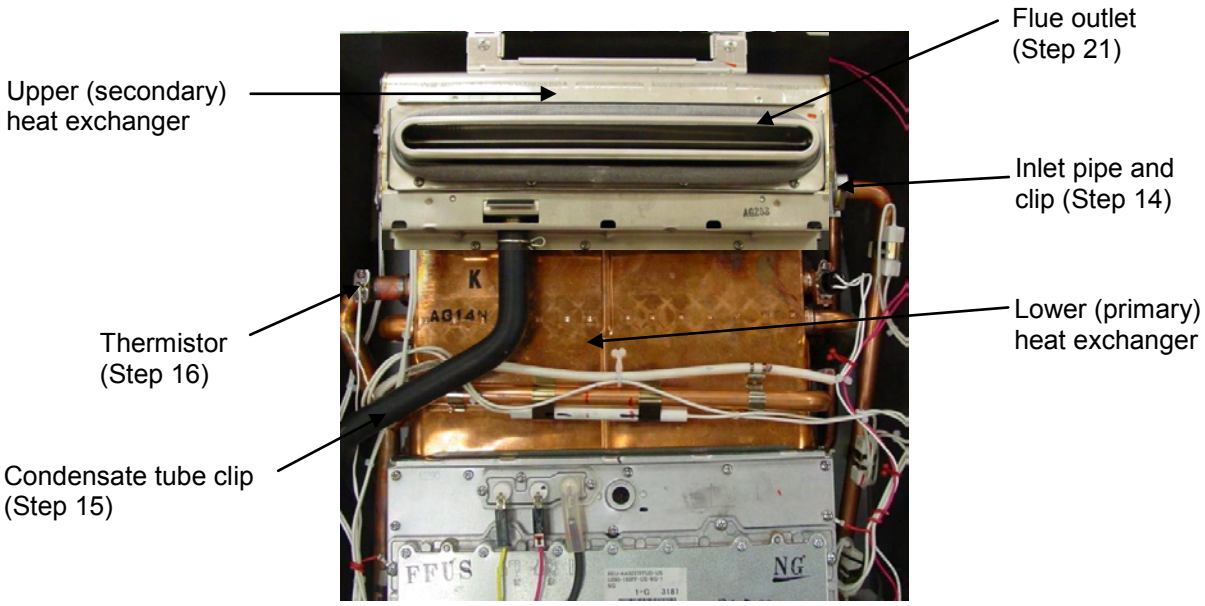
16. Disconnect heat exchanger thermistor (upper left).
17. Disconnect anti frost heater connector at bottom of cabinet. One blue and one green connector.
18. Disconnect thermal fuse harnesses (lower right). Single white wire connectors and single red wire connector.

Remove heat exchanger

19. Remove two screws at bottom of heat exchanger. Remove two screws at top back of heat exchanger. Remove two screws at top on reinforcement bracket for upper heat exchanger. Upper frost sensing switch is secured on reinforcement bracket—set aside.
20. Remove heat exchanger assembly.
21. **If replacing the upper (secondary) heat exchanger,** remove clips from two upper heat exchanger copper pipes. Disconnect pipes. Remove eight screws from flue outlet assembly. Discard screws.
    Remove two screws from reinforcement bracket. Discard screws.
22. Remove three screws on front where upper and lower heat exchangers meet. Discard screws. Turn heat exchanger over; remove six screws on back where upper and lower heat exchangers meet. Discard screws. Separate the upper heat exchanger from the lower heat exchanger.

Installation

23. Install new gasket from kit onto the upper heat exchanger. (Remove the old gasket if the upper heat exchanger is not new.) Attach upper heat exchanger to lower heat exchanger with new screws from kit. (six screws on back, three screw on front)
24. **If replacing the lower (primary) heat exchanger,** transfer wiring from old heat exchanger to new heat exchanger. Ensure proper routing of harnesses. These include thermal fuse, bi-metal, ceramic heaters.
25. Transfer parts from old heat exchanger to new heat exchanger.
26. **If replacing the upper (secondary) heat exchanger,** install connecting pipe to upper heat exchanger and copper tee with new o-ring and clip; and connecting pipe between upper heat exchanger and bypass valve with new o-ring and clip.
    Install the flue outlet assembly (8 screws) and the reinforcement bracket (2 screws).



27. Install heat exchanger assembly in case. Place bottom in cabinet first. Attach with four screws. (two at top back and two on bottom). Install reinforcement bracket with two screws. Ensure the frost sensing switch is installed.

Install water and drain lines

28. Install drain connecting pipe with new o-rings and attach with new clips.
29. Attach connecting pipe to by-pass valve with one screw and bracket. Attach other water line with one screw and bracket.
30. Attach the hot water outlet line to the hot water outlet fitting with one screw and bracket. Reconnect condensate tube to upper heat exchanger.

Reconnect wire harness

31. Reconnect heat exchanger thermistor (upper left).
32. Reconnect anti frost connector at bottom of cabinet. One blue and one green connector.
33. Reconnect thermal fuse harnesses (lower right). Single white wire connectors and single red wire connector.

Install burner and burner cover plate

34. Install burner assembly with two screws. Remove combustion chamber packing on sight glass plate. Install new packing, in kit, on sight glass plate. Install combustion chamber sight glass plate with eight screws.

Install gas manifold

35. Remove packing from gas control assembly. Discard. Install new packing, in kit, on gas control assembly.
36. Remove the packing for manifold. Install new packing, in kit, on gas manifold.
37. Reconnect the four connectors at bottom of manifold.
38. Attach the gas manifold with three machine screws at the gas control assembly. Install seven screws on gas manifold to heat exchanger. Attach wire harness ties.

Reconnect flame rod connectors and electrode

39. Install two flame rod connectors. (marked)
40. Install ignitor bracket with one machine screw.
41. Attach ignitor high tension cord to the electrode.
42. Turn on water supply, power supply, and gas supply. Check for gas and water leaks. Perform operational checks.
43. Install the front panel using four screws.

Heat Exchanger

RC98HPi

These instructions are for replacing the lower (primary) heat exchanger or the upper (secondary) heat exchanger.

1. Turn off gas supply.
2. Turn off water supply. Drain all water from the appliance.
3. Turn off 120V power supply.
4. Remove four screws securing the front panel. Remove front panel.

Remove controller assembly

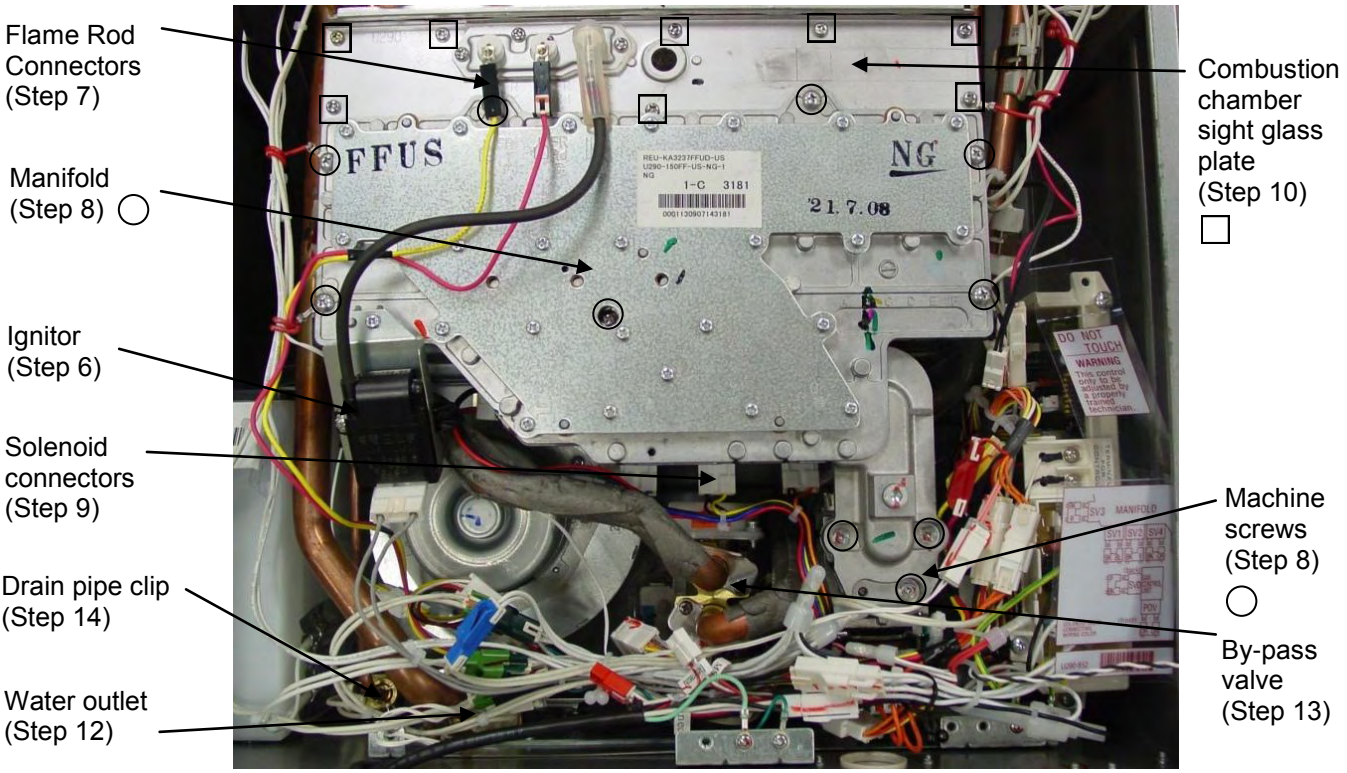
5. Remove temperature controller. Remove two screws for temperature controller bracket. Remove bracket.

Remove gas manifold

6. Remove high tension cord from electrode. Remove one screw for ignitor bracket. Remove ignitor bracket from manifold.
7. Remove red and yellow flame rod connectors.
8. Remove seven pan head screws from manifold. (Six screws on outer edge, one screw in middle and three machine screws from bottom of manifold to gas valve.)
9. Remove four connectors from the solenoids at the bottom of the manifold. Remove manifold.
10. Remove eight screws for the combustion chamber sight glass plate. Remove plate.
11. Remove two screws attaching the burner to the heat exchanger. Pull out the burner.

Disconnect water lines

12. Remove one screw from hot water line bracket. Remove bracket by rotating and moving it up toward the bend in the tube where the diameter is smaller.
13. Remove two screws and two brackets at by-pass valve assembly.
14. Remove lower clip from drain connecting pipe.


Flame Rod Connectors (Step 7)
Manifold (Step 8) ◯
Ignitor (Step 6)
Solenoid connectors (Step 9)
Drain pipe clip (Step 14)
Water outlet (Step 12)
Combustion chamber sight glass plate (Step 10) □
Machine screws (Step 8) ◯
By-pass valve (Step 13)
NG
21.7.08

15. Remove the clip on the heat exchanger inlet pipe on right side of heat exchanger. Remove the two anti frost heaters from pipe. Remove heat exchanger inlet pipe.
16. Disconnect condensate tube from upper heat exchanger.

Disconnect wire harness

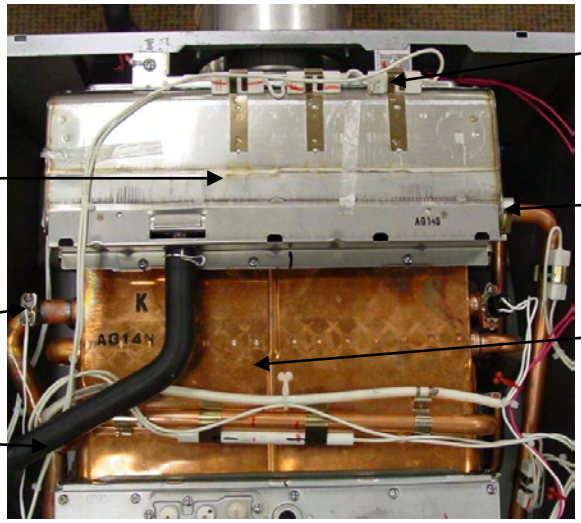
17. Disconnect heat exchanger thermistor (upper left).
18. Remove three anti frost heaters from clips at top of heat exchanger.
19. Disconnect anti frost heater connectors at bottom of cabinet. (one green connector with cables leading to the right side, one blue connector.)
20. Disconnect burner sensor harness (lower right).
21. Disconnect thermal fuse harnesses (lower right). Single white wire connector, single red wire connector.
22. Disconnect fan connector.

Remove heat exchanger

23. Remove two screws at bottom of heat exchanger. Remove two screws at top back of heat exchanger. Remove two screws at top on reinforcement bracket for upper heat exchanger. Upper frost sensing switch is secured on reinforcement bracket, set aside.
24. Remove four screws for flue connection assembly. Remove flue connection.
25. Remove heat exchanger assembly.
26. Remove anti frost heater from connecting pipe between upper heat exchanger and copper tee on left side. Remove clips and connecting pipe.
27. Remove three screws on front, where upper and lower heat exchangers meet. Discard screws. Turn heat exchanger over; remove six screws on back where upper and lower heat exchangers meet. Discard screws. Separate the upper heat exchanger from the lower heat exchanger.
28. **If replacing the upper (secondary) heat exchanger,** then remove fourteen screws to separate it from the air inlet box assembly. Discard screws and remove air inlet box assembly. Remove the old gasket from the air inlet box assembly. Install new gasket from kit. Attach air inlet box assembly with new screws (fourteen) from kit. Ensure reinstallation of reinforcement bracket on top of air inlet box assembly.

Installation

29. Install new gasket from kit onto the upper heat exchanger. (Remove the old gasket if the upper heat exchanger is not new.) Attach upper heat exchanger to the lower heat exchanger with new screws from kit. (six screws on back, three screw on front)
30. **If replacing the lower (primary) heat exchanger,** transfer wiring from old heat exchanger to new heat exchanger. Ensure proper routing of harnesses. These include burner sensor with new gasket, thermal fuse, bi-metal, ceramic heaters.


Anti frost heaters/clips (Step 18)
Upper (secondary) heat exchanger
Inlet pipe clip (Step 15)
Thermistor (Step 17)
Lower (primary) heat exchanger
Condensate tube clip (Step 16)

31. **If replacing the lower (primary) heat exchanger,** transfer parts from old heat exchanger to new heat exchanger. These include fan housing assembly, connecting pipe to upper heat exchanger and copper tee with new o-ring and clip, drain pipe from copper tee.
32. Install heat exchanger assembly in case. Place bottom in cabinet first. Attach with four screws. (two at top back and two on bottom) Attach reinforcement bracket with two screws.
33. Remove old gasket from flue connection assembly. Install new gasket from kit. Attach flue connections assembly with four screws.

Install water and drain lines

34. Install drain connecting pipe with new o-rings and attach with new clips.
35. Install water inlet connecting pipe with new o-rings to upper heat exchanger. Attach with new clip at heat exchanger and at bottom to the by-pass valve with one screw and bracket. Attach the other water line with one screw and bracket.
36. Attach the hot water outlet line to the hot water outlet fitting with one screw and bracket. Reconnect condensate tube to upper heat exchanger.

Reconnect wire harness

37. Reconnect heat exchanger thermistor (upper left).
38. Install three anti frost heaters in clips at top of upper heat exchanger.
39. Reconnect anti frost connectors at bottom of cabinet. One green connector, one blue connector.
40. Reconnect burner sensor harness (lower right).
41. Reconnect thermal fuse harnesses (lower right). Single white wire connector, single red wire connector.
42. Reconnect the fan connector.

Install burner and burner cover plate

43. Install burner assembly with two screws. Replace combustion chamber packing (in kit) on sight glass plate. Install combustion chamber sight glass plate with eight screws.

Install gas manifold

44. Remove packing from gas control assembly. Discard. Install new packing, in kit, on gas control assembly.
45. Remove the packing for manifold. Install new packing, in kit, on gas manifold.
46. Attach the gas manifold with three machine screws at the gas control assembly. Install seven pan head screws on gas manifold to heat exchanger. Attach wire harness ties. (six screws at outer edge, one middle of gas manifold plate)
47. Install four connectors to the solenoids on the gas manifold. (marked)

Reconnect flame rod connectors and electrode

48. Install two flame rod connectors. (marked)
49. Install ignitor bracket with one machine screw.
50. Attach ignitor high tension cord to the electrode.
51. Attach controller bracket with one machine screw and one screw from power wire clamp. Install controller in bracket.

Check

52. Turn on water supply, power supply, and gas supply. Check for gas and water leaks. Perform operational checks.
53. Install the front panel using four screws.

KB Series Component Replacement Instructions

Heat Exchanger

RU80i/e, RU98i/e

1.Turn off gas supply.

2.Turn off 120 V power supply.

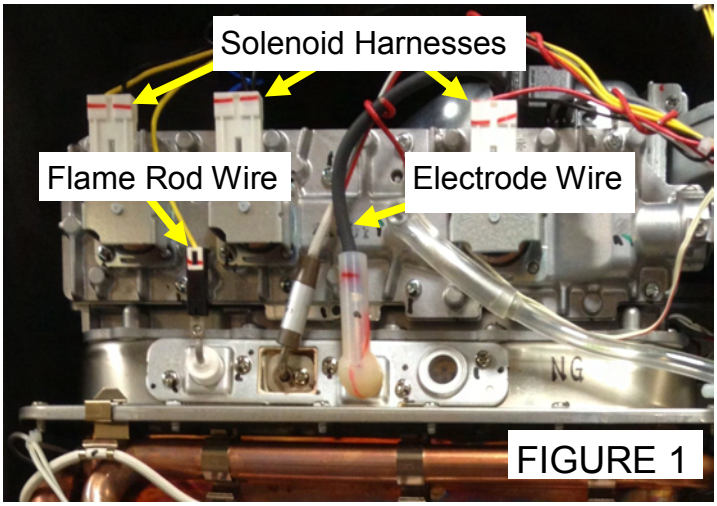
3.Turn off water supply and drain unit.

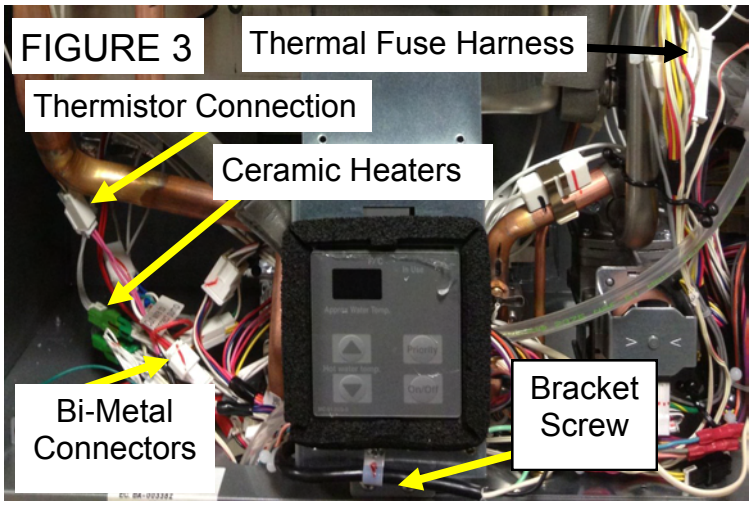
4.Remove four screws securing front panel. Remove front panel.

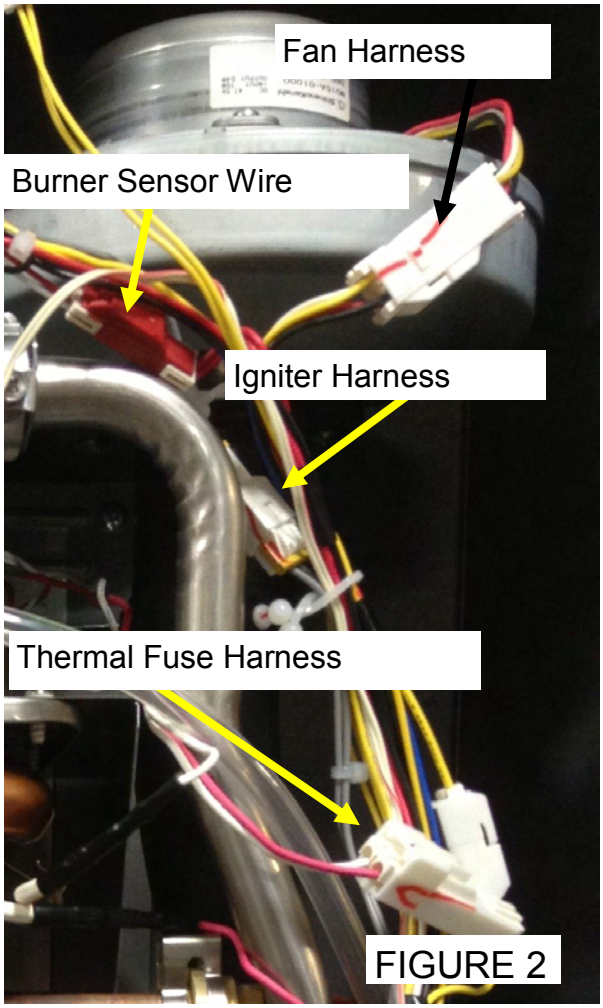
5.Disconnect solenoid valve harnesses (SV1, SV2, SV3), flame rod wire (yellow), electrode wire (black). (FIGURE 1)

6.Disconnect fan harness, thermal fuse harnesses (upper & lower FIGURES 2 & 3), igniter harness, & burner sensor harness. Remove 1 screw from gas pipe to manifold connection and rotate gas pipe to the right to move it out of the way. (Put screw back into connection so as not to lose it) (External Units will have a freeze protection thermistor) (FIGURE 2)

7.Disconnect thermal fuse harness, heat exchanger thermistor connection, ceramic heaters, bi-metal connectors, & remove controller bracket. (FIGURE 3)







RU80i/e, RU98i/e

Heat Exchanger

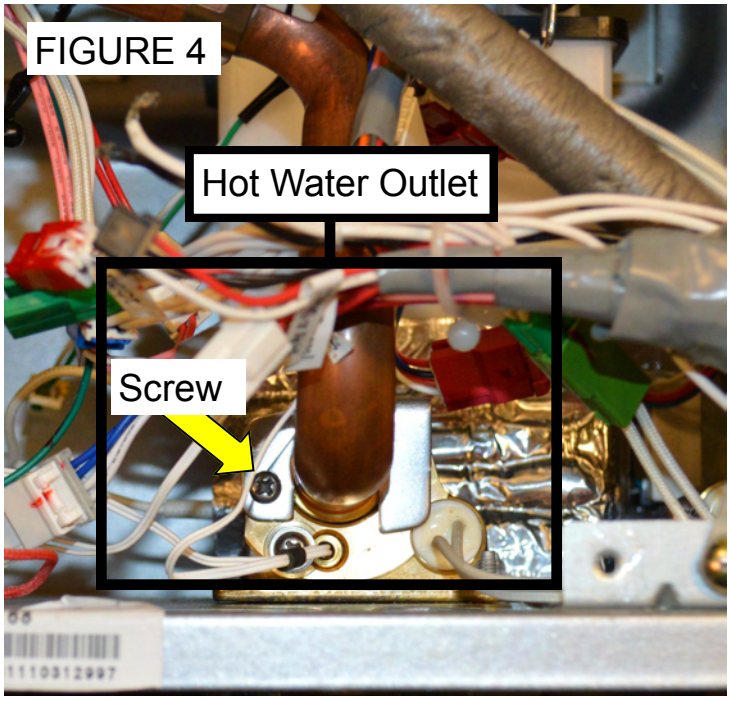
8.Remove 1 screw from water outlet retainer clip. Remove clip and then remove water line from fitting. *(A small amount of water may still be present be sure not to let water come into contact with electrical components)* (FIGURE 4)

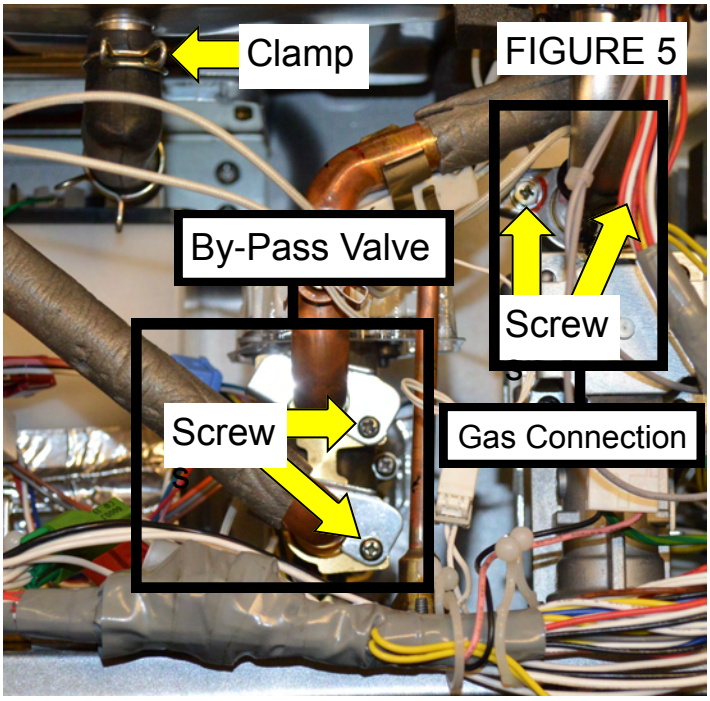
9.Remove 2 Screws from by-pass retainer clips. Remove Clips and disconnect water lines out of fitting. (FIGURE 5)

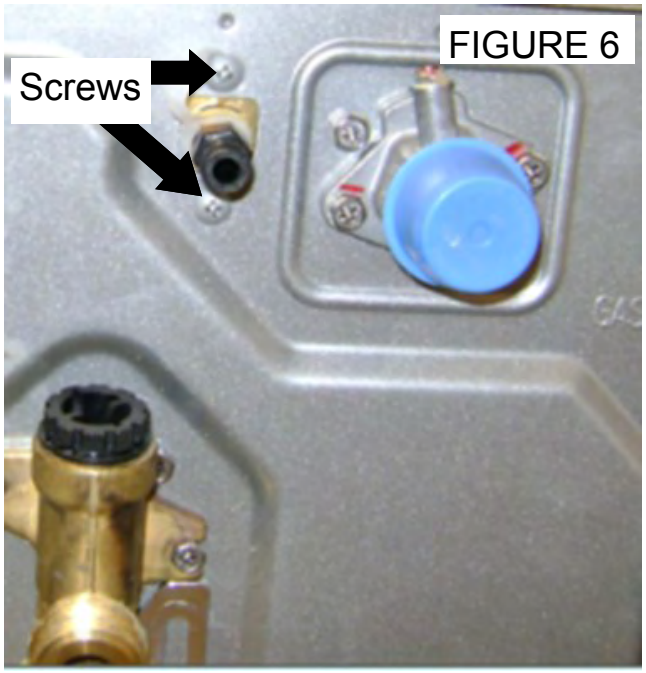
10.Remove rubber hose connection from condensate trap using clamp. (FIGURE 5)

11.Remove 2 screws from gas valve connection and disconnect gas line. (FIGURE 5)

12.Disconnect drain line (if applicable) from drain tube, then remove 2 screws securing copper drain tube. (FIGURE 6)



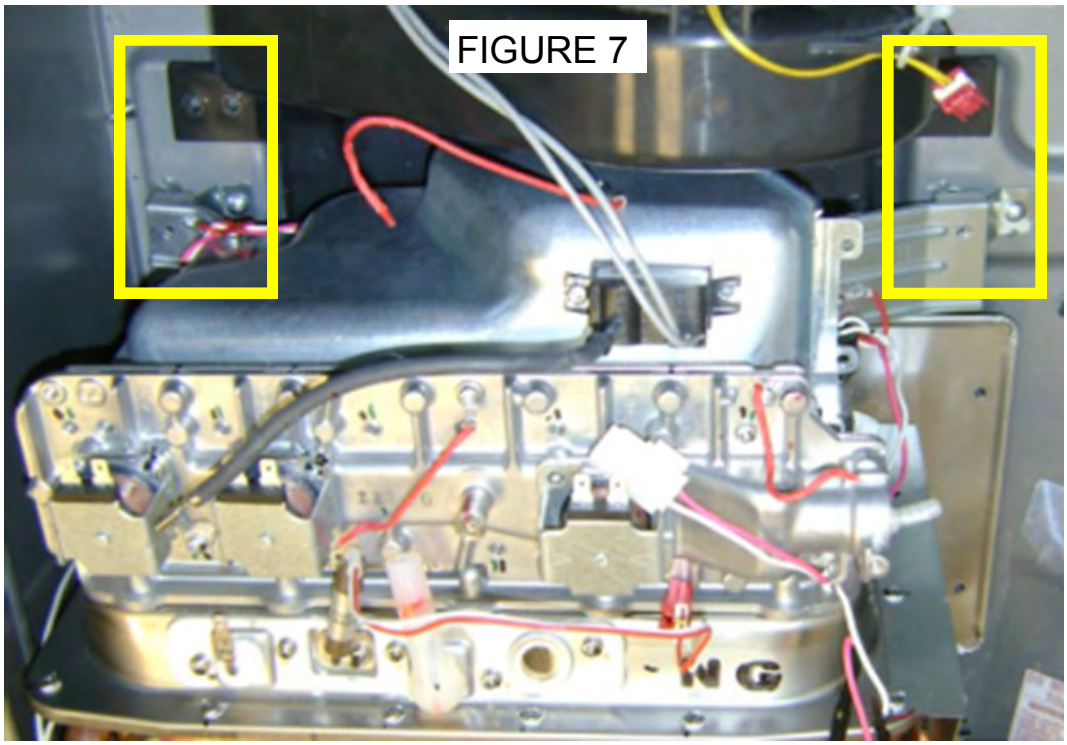




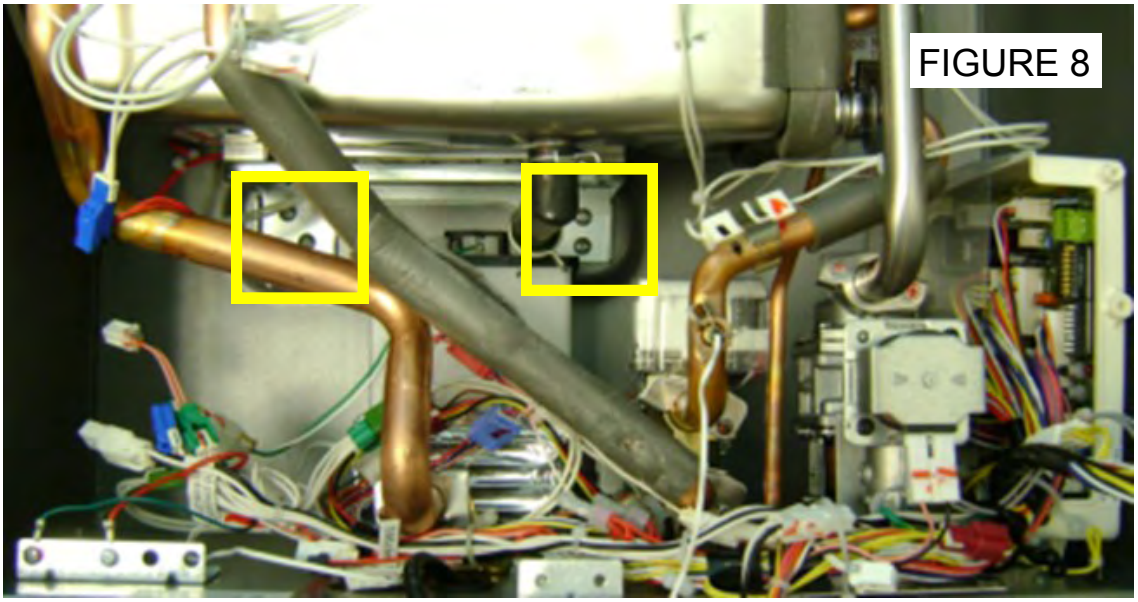
Heat Exchanger

RU80i/e, RU98i/e

13.Remove 6 screws at top of heat exchanger. (FIGURE 7)



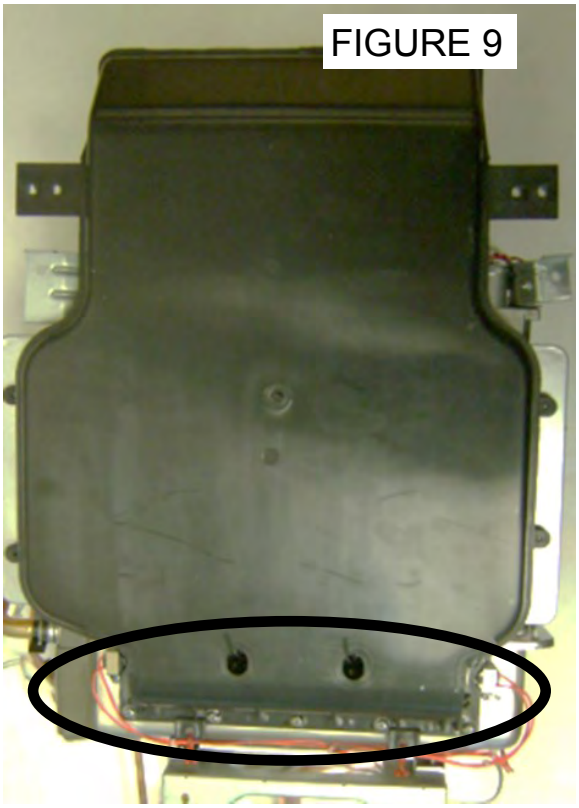
14.Remove 4 screws at bottom of heat exchanger. The heat exchanger can now be removed from the cabinet. Be careful not to handle the heat exchanger by the plastic black air box on the back so as not to damage the air intake. (FIGURE 8)



Heat Exchanger

RU80i/e, RU98i/e

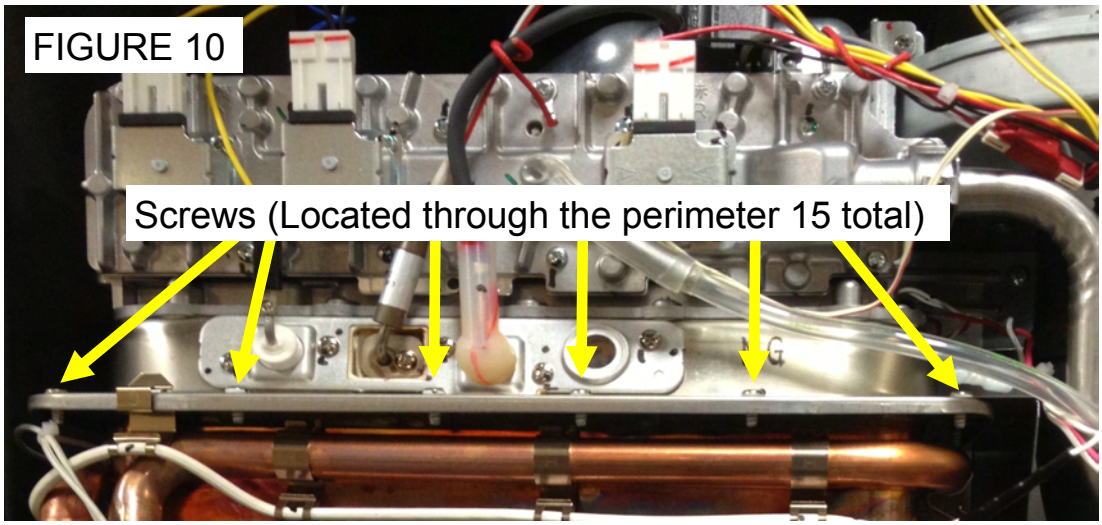
15.Remove 9 screws to separate the air box from rear of heat exchanger. (FIGURE 9)



⚠ CAUTION

Use extreme caution! The following step will expose the burner. The burner is a downward firing ceramic cassette and is very fragile.

16.Remove 15 screws around the perimeter where heat exchanger joins burner assembly (the screws will have a white coating, these screws can only be used once, do not use again, the kit will include new screws). (FIGURE 10)



RU80i/e, RU98i/e

Heat Exchanger

17.Be sure to inspect the flame rod, and igniter electrode for damage or corrosion. Be sure to also

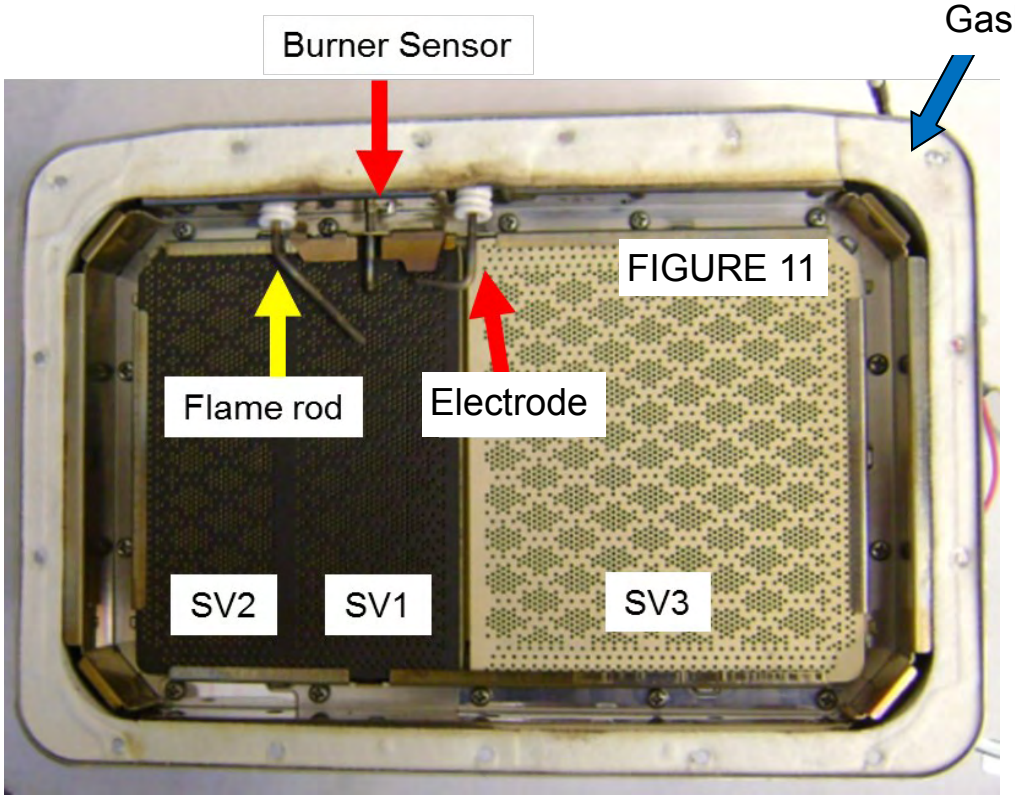


FIGURE 11

18.Remove 14 screws around the perimeter where primary heat exchanger joins secondary heat exchanger (the screws will have a white coating, these screws can only be used once, do not use again, the kit will include new screws). (FIGURE 12)

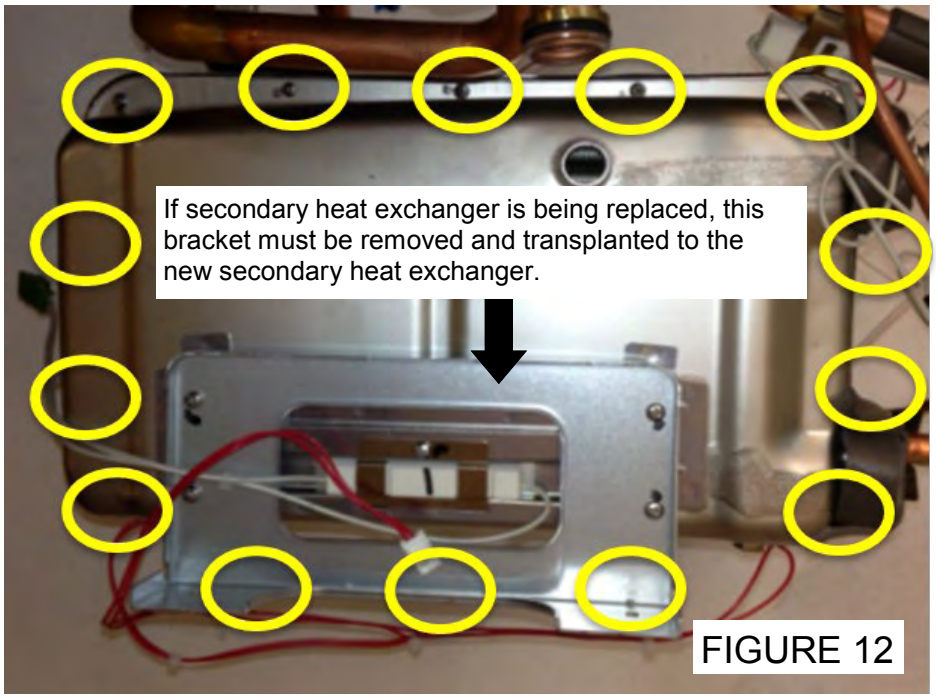

If secondary heat exchanger is being replaced, this bracket must be removed and transplanted to the new secondary heat exchanger.

FIGURE 12

Heat Exchanger-Reassembly

RU80i/e, RU98i/e

19. The following parts must be transferred from the original primary and/or secondary heat exchanger(s) over to the replacement:
    heat exchanger thermistor, 3 Bi-Metal Over Heat Switches (the 3rd of which is 2 Bi-Metals on one harness), Thermal Fuse, inlet connection pipe, heat exchanger connection pipe, secondary top plate (if steel heat exchanger replaced) and ceramic heaters.
20. Attach primary heat exchanger to secondary heat exchanger using 14 screws. (These screws will have a white coating and will be included in the replacement kit.) DO NOT USE THE ORIGINAL 14 SCREW WITH THE WHITE COATING FROM ORIGINAL HEAT EXHANGERS. Be sure to use the new gasket(s) included in the replacement kit. (FIGURE 12)
21. Attach burner assembly to primary heat exchanger using 15 screws. (These screws will have a white coating and will be included in the replacement kit.) DO NOT USE THE ORIGINAL 14 SCREW WITH THE WHITE COATING FROM ORIGINAL HEAT EXHANGERS. Be sure to use the new gasket(s) included in the replacement kit. (FIGUREs 12 & 10)
22. Attach air box to rear of heat exchanger using 9 screws. (FIGURE 9)
23. Place heat exchanger assembly into cabinet of unit.
24. Attach bottom of heat exchanger to cabinet using 4 screws. (FIGURE 8)
25. Attach top of heat exchanger to cabinet using 6 screws. (FIGURE 7)
26. Secure copper drain tube to bottom of unit using 2 screws. Reconnect drain line (if applicable) to drain tube. (FIGURE 6)
27. Attach rubber hose connection to condensate trap using clamp to secure. (FIGURE 5)
28. Attach inlet water lines to by-pass fitting using the retainer clips to secure them. Use 2 screws to secure the retainer clips in place. (FIGURE 5)
29. Attach gas line to gas connection using the retainer clip to secure it. Use 2 screws (mechanical screws) to secure retainer clip in place. (FIGURE 5)
30. Attach outlet water line to fitting using retainer clip to secure it. Use 1 screw to secure retainer clip into place. (FIGURE 4)
31. Connect thermal fuse harness, heat exchanger thermistor connection, ceramic heater connections, bi-metal connections, and re-install controller bracket. (FIGURE 3)
32. Connect fan harness, thermal fuse harnesses (upper and lower see FIGURES 2 & 3), igniter harness, and burner sensor harness. Rotate gas pipe to the left back toward connection and secure using 1 screw (which should still be in receptacle from before). (External units will have an additional freeze protection thermistor) (FIGURE 2)
33. Connect solenoid valve harnesses (SV1, SV2, SV3), flame rod wire (Yellow), electrode wire (black). (FIGURE 1)
34. Turn on water supply and gas supply checking for leaks.
35. Turn on 120 V power supply.
36. Install front panel and secure with 4 screws.
37. Test fire unit.

KA Series Gas Pressure Setting Procedure

Complete this section if gas valve has been changed, for high altitude installation , or after converting gas type.

Confirm that the inlet gas pressure is between the minimum and maximum pressures allowed for this appliance.

⚠ CAUTION

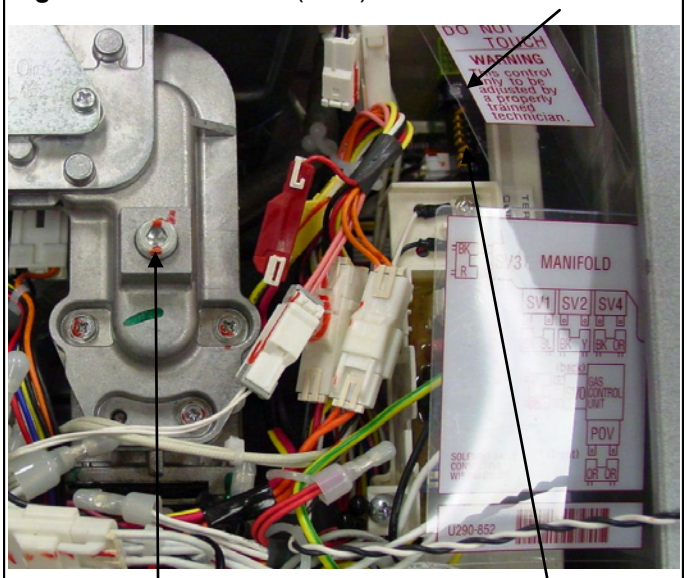
Do not touch any other areas on the PC board besides the “SW” switches while power is supplied to the appliance. Parts of the PC board are supplied with 120 volts AC.

⚠ CAUTION

Do not touch the areas at or near the heat exchanger or hot water lines. These areas become very hot and could cause burns.

1. Remove the front panel (four screws).
2. Calibrate the low fire and high fire settings as follows:
   A. Remove the allen head plug and attach the manometer to the burner test point located on the gas control. (Figure 1-2)
   B. Turn on the gas supply.
   C. Turn on the power supply.
   D. Flow water through the water heater at the maximum flow rate obtainable. (At least 3 gallons per minute is recommended. If there is not enough water flowing, the water heater could shut off or sustain damage due to

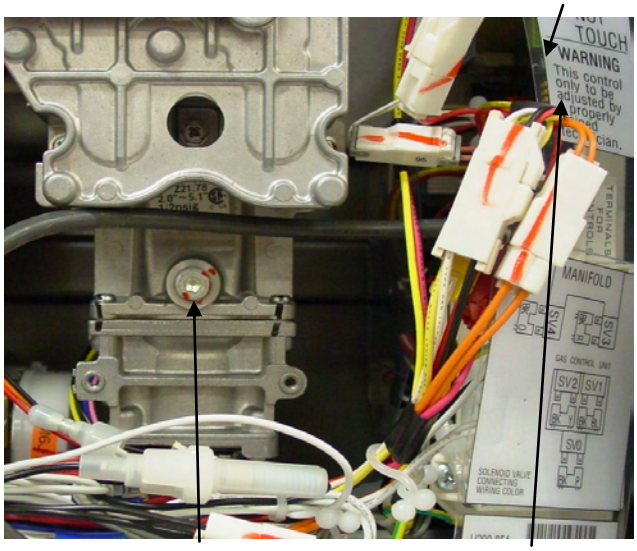
Figure 1 Potentiometer (POT)



Burner test point Dip switches (SW1)

Models RC98HPe, RC98HPi

Figure 2 Potentiometer (POT)



Burner test point Dip switches (SW1)

Models RC80HPe, RC80HPi

overheating.)

E. Move No. 7 dip switch of the SW1 bank to the ON position to calibrate “Forced Low” combustion. (Figure 4)

F. Check the burner test point pressure.

G. Remove the rubber access plug (Figure 3) and adjust the regulator screw on the modulating valve to obtain the correct low fire manifold pressure. Refer to the Manifold Gas Pressure Settings section, page 101-105. Install rubber access plug.

H. Move No. 7 and No. 8 dip switches of the SW1 bank to the ON position to calibrate “Forced High” combustion. (Figure 5)

I. Check the burner test point pressure.

J. Adjust the high pressure Potentiometer (POT) (Figure 1-2) on the PC Board to obtain the correct high fire manifold pressure. Refer to the Manifold Gas Pressure Settings section, page 101-105.

K. Move No. 7 and No. 8 back to the OFF position to return the appliance to “Normal” combustion. (Figure 6)

L. Close hot water taps.

M. Turn off gas supply and 120 V power supply.

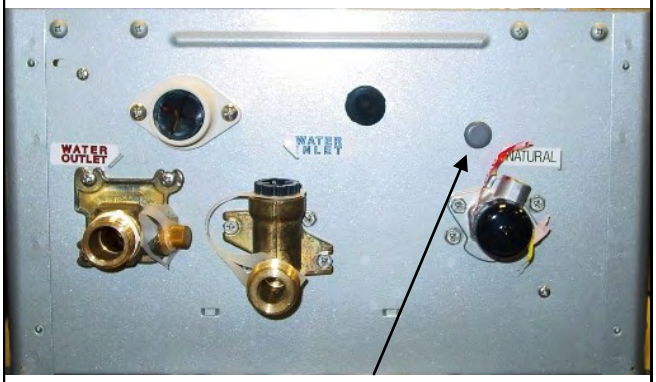
N. Remove manometer and re-install allen head plug.

O. Turn on the gas supply and 120 V power supply.

P. Operate the unit and check for gas leaks.

3. Install the front panel using four screws.

Figure 3



Access plug

Figure 4

Forced Low

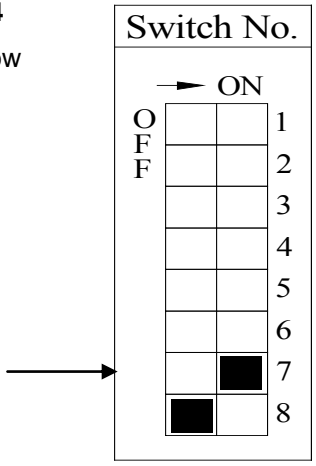


Figure 5

Forced High

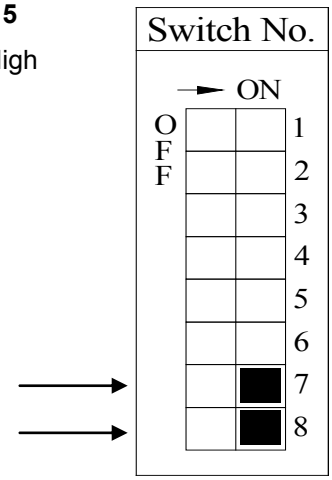
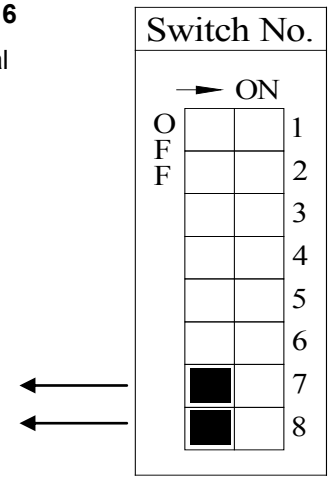


Figure 6

Normal



Condensing Models

Dip Switch Setting	Altitude	Natural Gas (Gaz Naturel)				Propane Gas (Gaz propane)			
		MAX VENT Dip Switch #1 is OFF		MIN VENT Dip Switch #1 is ON		MAX VENT Dip Switch #1 is OFF		MIN VENT Dip Switch #1 is ON	
		Max Rate inches W.C.	Min Rate inches W.C.	Max Rate inches W.C.	Min Rate inches W.C.	Max Rate inches W.C.	Min Rate inches W.C.	Max Rate inches W.C.	Min Rate inches W.C.
RC80HPi (REU-KA2530FFUD-US)									
#2 OFF, #3 OFF	0-2000 ft (0-610 m)	3.00	0.81	2.90	0.70	3.80	1.11	3.7	1.06
#2 OFF, #3 ON	2001-5200 ft (610-1585 m)	2.90	0.70	3.20	0.70	3.80	0.90	3.9	0.70
#2 ON, #3 OFF	5201-7700 ft (1585-2277 m)	2.90	0.55	2.90	0.55	3.80	0.90	3.9	0.55
#2 ON, #3 ON	7701-10200 ft (2277-3109 m)	2.90	0.55	2.85	0.55	3.40	1.00	3.5	0.55
RC98HPi (REU-KA3237FFUD-US)									
#2 OFF, #3 OFF	0-2000 ft (0-610 m)	2.70	1.08	2.40	0.85	4.00	1.46	3.60	1.22
#2 OFF, #3 ON	2001-5200 ft (610-1585 m)	2.40	0.80	2.40	0.80	3.60	1.30	3.30	1.10
#2 ON, #3 OFF	5201-7700 ft (1585-2277 m)	2.40	0.80	2.40	0.80	3.60	1.20	3.30	1.10
#2 ON, #3 ON	7701-10200 ft (2277-3109 m)	2.40	0.80	2.40	0.90	3.20	1.10	3.20	1.00

Dip Switch Setting	Altitude	Natural Gas (Gaz Naturel)		Propane Gas (Gaz propane)	
		Max Rate inches W.C.	Min Rate inches W.C.	Max Rate inches W.C.	Min Rate inches W.C.
RC80HPe (REU-KA2530WD-US)					
#2 OFF, #3 OFF	0-2000 ft (0-610 m)	2.70	0.61	3.60	0.92
#2 OFF, #3 ON	2001-5200 ft (610-1585 m)	2.90	0.60	3.70	1.00
#2 ON, #3 OFF	5201-7700 ft (1585-2277 m)	2.90	0.60	3.70	1.00
#2 ON, #3 ON	7701-10200 ft (2277-3109 m)	2.90	0.60	3.40	1.00
RC98HPe (REU-KA3237WD-US)					
#2 OFF, #3 OFF	0-2000 ft (0-610 m)	2.20	0.63	3.10	1.00
#2 OFF, #3 ON	2001-5200 ft (610-1585 m)	2.20	0.70	3.10	1.00
#2 ON, #3 OFF	5201-7700 ft (1585-2277 m)	2.20	0.70	3.10	1.00
#2 ON, #3 ON	7701-10200 ft (2277-3109 m)	2.20	0.70	3.00	1.00

KB Series Gas Pressure Setting Procedure

Complete this section if gas valve has been changed, for high altitude installation , or after converting gas type.

Confirm that the inlet gas pressure is between the minimum and maximum pressures allowed for this appliance.

⚠ CAUTION

Do not touch any other areas on the PC board besides the “SW” switches while power is supplied to the appliance. Parts of the PC board are supplied with 120 volts AC.

⚠ CAUTION

Do not touch the areas at or near the heat exchanger or hot water lines. These areas become very hot and could cause burns.

1. Turn OFF the gas supply.
2. Turn OFF the power supply.
3. Remove the front panel (four screws).
4. Check the gas type using the data plate on the side of the unit. Confirm that the gas type switch is in the correct position (switch 1 of SW2 is ON for natural gas, NG, and OFF for propane gas, LPG.) Figure 4.
5. Remove the screw and attach the manometer to the burner test point located on the gas control. Figure 5.
6. Turn on the gas supply and the power supply.
7. Flow water through the water heater at the maximum flow rate obtainable. (At least 3-4 gallons per minute is recommended. If there is not enough water flowing, the water heater could shut off or sustain damage due to overheating.)
8. Move switch 8 of SW1 to ON. Figure 4.
9. Push the PC board switch A for one second, red light will be solid.
10. Calibrate “Forced Low” (Min Rate) combustion using switch A to increase pressure and switch B to decrease pressure. Use the Gas Pressure Settings on page 54, gas type, and altitude.
11. Move switch 8 of SW1 to OFF and then back to ON.
12. Push the PC board switch B for one second, red light will be flashing.

Figure 4

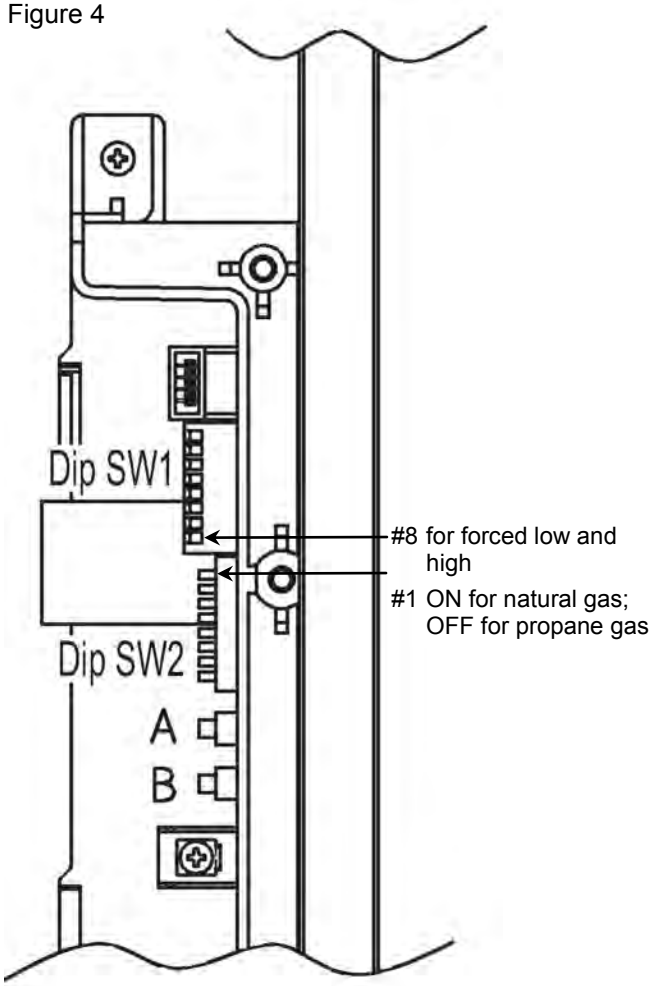
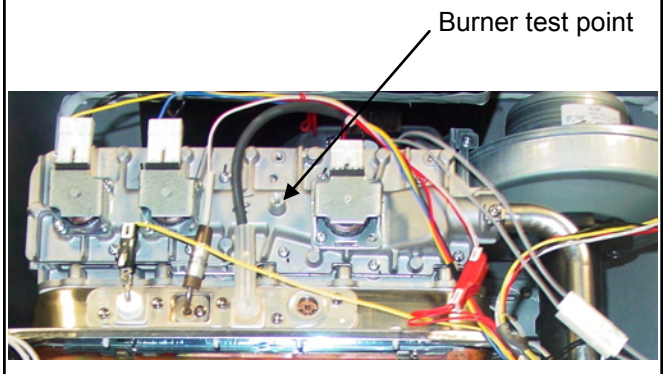
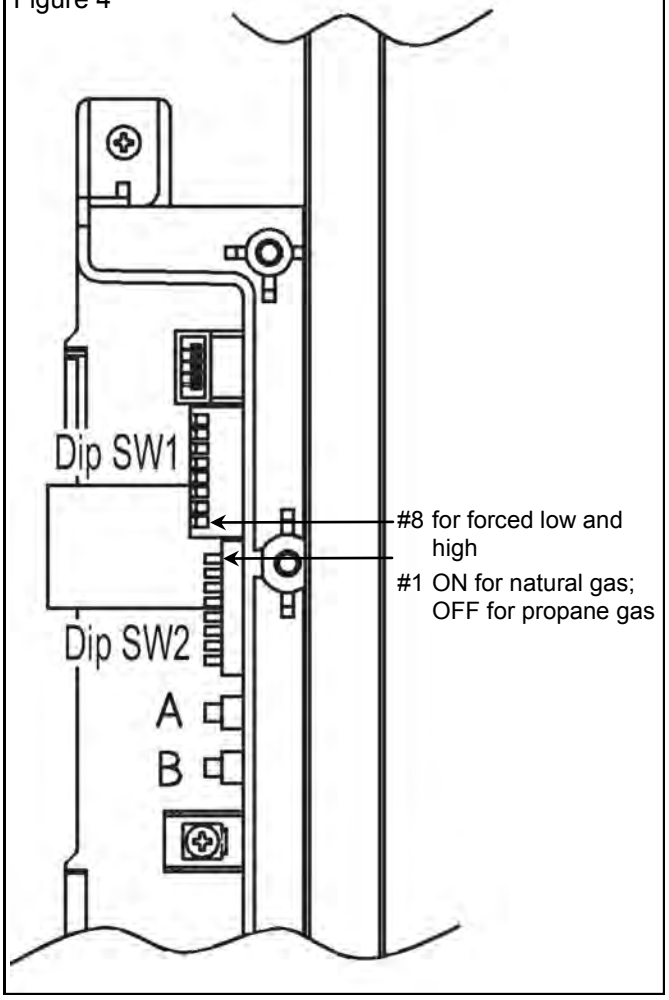


Figure 5



13. Calibrate “Forced High” (Max Rate) combustion using switch A to increase pressure and switch B to decrease pressure. Use the Gas Pressure Settings on page 54, gas type, and altitude.
14. Move switch 8 of SW1 to OFF.
15. Close hot water taps.
16. Turn off gas supply and 120 V power supply.
17. Remove manometer and re-install screw.
18. Turn on the gas supply and 120 V power supply.
19. Operate the unit and check for gas leaks.
20. Install the front panel using four screws.

Figure 4



KB Gas Pressure Settings

Altitude	Natural Gas		Propane Gas		Natural Gas		Propane Gas	
	Short Vent Length (switch #1 on SW1 is ON)				Long Vent Length (switch #1 on SW1 is OFF)			
	Max Rate inches W.C. (mm W.C.)	**Min Rate** inches W.C. (mm W.C.)	**Max Rate** inches W.C. (mm W.C.)	**Min Rate** inches W.C. (mm W.C.)	**Max Rate** inches W.C. (mm W.C.)	**Min Rate** inches W.C. (mm W.C.)	**Max Rate** inches W.C. (mm W.C.)	**Min Rate** inches W.C. (mm W.C.)
RU80i (REU-KB2530FFUD-US)								
0-2000 ft (0-610 m)	1.9 (48)	0.51 (13)	2.3 (58)	0.52 (13)	2.0 (51)	0.53 (13)	2.4 (61)	0.55 (14)
2001-5200 ft (610-1585 m)	2.4 (61)	0.45 (11)	2.4 (61)	0.45 (11)	2.4 (61)	0.40 (10)	2.6 (66)	0.45 (11)
5201-7700 ft (1585-2277 m)	2.6 (65)	0.45 (11)	2.2 (56)	0.45 (11)	2.7 (69)	0.45 (11)	2.2 (56)	0.45 (11)
7701-10200 ft (2277-3109 m)	2.2 (56)	0.40 (10)	1.9 (48)	0.40 (10)	2.2 (56)	0.40 (10)	2.0 (51)	0.40 (10)
RU98i (REU-KB3237FFUD-US)								
0-2000 ft (0-610 m)	3.1 (79)	0.51 (13)	3.7 (94)	0.52 (13)	3.3 (84)	0.53 (13)	3.9 (99)	0.55 (14)
2001-5200 ft (610-1585 m)	3.0 (76)	0.45 (11)	3.1 (79)	0.45 (11)	3.0 (76)	0.45 (11)	3.1 (79)	0.50 (13)
5201-7700 ft (1585-2277 m)	2.7 (69)	0.40 (10)	2.9 (74)	0.45 (11)	2.7 (69)	0.45 (11)	3.0 (76)	0.45 (11)
7701-10200 ft (2277-3109 m)	2.4 (61)	0.40 (10)	2.0 (51)	0.40 (10)	2.5 (64)	0.40 (10)	2.0 (51)	0.45 (11)

Altitude	Natural Gas		Propane Gas	
	Max Rate (rythme max) inches W.C. (mm W.C.)	**Min Rate (rythme min)** inches W.C. (mm W.C.)	**Max Rate (rythme max)** inches W.C. (mm W.C.)	**Min Rate (rythme min)** inches W.C. (mm W.C.)
RU80e (REU-KB2530WD-US)				
0-2000 ft (0-610 m)	1.9 (48)	0.46 (12)	2.1 (53)	0.50 (13)
2001-5200 ft (610-1585 m)	2.3 (58)	0.40 (10)	2.4 (61)	0.43 (11)
5201-7700 ft (1585-2277 m)	2.7 (69)	0.40 (10)	2.1 (53)	0.40 (10)
7701-10200 ft (2277-3109 m)	2.2 (56)	0.40 (10)	1.9 (48)	0.40 (10)
RU98e (REU-KB3237WD-US)				
0-2000 ft (0-610 m)	3.0 (76)	0.46 (12)	3.5 (89)	0.50 (13)
2001-5200 ft (610-1585 m)	2.9 (74)	0.40 (10)	3.0 (76)	0.45 (11)
5201-7700 ft (1585-2277 m)	2.7 (69)	0.40 (10)	2.8 (71)	0.45 (11)
7701-10200 ft (2277-3109 m)	2.3 (58)	0.40 (10)	2.0 (51)	0.40 (10)

KA Series Dip Switch Settings

KA Series Condensing

RC80HPi, RC80HPe, RC98HPe, RC98HPi

SW1 Bank

<table>
<tr><td>1</td><td>OFF - “Long Flue”
ON - “Short Flue” and Outdoor Models

“Long flue” is defined as:
0 elbows and length is greater than 21 ft
1 elbow and length is greater than 15 ft
2 elbows and length is greater than 9 ft</td></tr>
<tr><td>2</td><td rowspan="2">Settings dependent on altitude

<table><tr><td>0-2000 ft
(0-610 m)</td><td>2001-5200 ft
(610-1585 m)</td><td>5201-7700 ft
(1585-2347 m)</td><td>7701-10200 ft
(2347-3109 m)</td></tr><tr><td>#2: OFF</td><td>#2: OFF</td><td>#2: ON</td><td>#2: ON</td></tr><tr><td>#3: OFF</td><td>#3: ON</td><td>#3: OFF</td><td>#3: ON</td></tr></table></td></tr>
<tr><td>3</td></tr>
<tr><td>4</td><td>OFF</td></tr>
<tr><td>5</td><td>OFF - 120ºF default temperature without a controller
ON - 140ºF default temperature without a controller</td></tr>
<tr><td>6</td><td>OFF - 120ºF maximum temperature
without an MCC-91 controller
ON - 140ºF maximum temperature
without an MCC-91 controller</td></tr>
<tr><td>7</td><td rowspan="2">OFF position - Used for low fire and high fire settings. Refer to the gas pressure setting procedure.</td></tr>
<tr><td>8</td></tr>
</table>

* RC80HPi, RC80HPe, RC98HPe, RC98HPi models have a default maximum temperature of 120º F (49º C) and an option to increase the maximum temperature to 140 ºF (60 ºC). Temperature settings from 125-140 ºF (52-60 ºC) are available by setting dip switch 6 to ON in the SW1 bank of 8 dip switches.

SW2 Bank (present on replacement PC boards only)

1	OFF - Propane Gas ON - Natural Gas
2	OFF - Outdoor model ON - Indoor model
3	OFF - R75LSe-VB, R75LSi-VB, R94LSe-VB, R94LSi-VB, RC98HPe, RC98HPi ON - RC80HPi, RC80HPe
4	OFF position
5	OFF position
6	OFF position

KB Series Dip Switch Settings

KB Series Condensing

RU80i, RU80e, RU98e, RU98i

SW1 Bank

1	OFF - "Long Flue" ON - "Short Flue" and Outdoor Models "Long flue" is defined as: 0 elbows and length is greater than 21 ft 1 elbow and length is greater than 15 ft 2 elbows and length is greater than 9 ft
2	Settings dependent on altitude
3	

0-2000 ft (0-610 m)	2001-5200 ft (610-1585 m)	5201-7700 ft (1585-2347 m)	7701-10200 ft (2347-3109 m)
#2: OFF	#2: OFF	#2: ON	#2: ON
#3: OFF	#3: ON	#3: OFF	#3: ON

4	OFF (Air Handler)
5	OFF - 120ºF fixed temperature without a controller ON - 140ºF fixed temperature without a controller
6	OFF - 120ºF maximum temperature without an MCC-91-2 controller ON - 140ºF maximum temperature without an MCC-91-2 controller
7	OFF (Units in standby with EZConnect™)
8	OFF

* RU80i, RU80e, RU98e, RU98i models have a default maximum temperature of 120º F (49º C) and an option to increase the maximum temperature to 140 ºF (60 ºC). Temperature settings from 125-140 ºF (52-60 ºC) are available by setting dip switch 6 to ON in the SW1 bank of 8 dip switches.

SW2 Bank (present on replacement PC boards only)

1	OFF - Propane Gas ON - Natural Gas
2	OFF (Optional Temperature Table)
3	OFF (Optional Temperature Table)
4	OFF (Recirculation Pump)
5	OFF
6	ON for RU80 OFF for RU98
7	OFF
8	OFF (Recirculation - Insulation)

Notes

Notes

Notes

A tradition of
TRUE RELIABILITY.

For nearly 100 years, we at Rinnai have been fiercely committed to delivering nothing less than our absolute best at every touch point.

To us, that means more than manufacturing products—it's about inspiring confidence in our customers. Confidence in the comfort our solutions give. And in the support we provide.

Learn more about our high-performance Tankless Water Heaters, Boilers and Direct Vent Wall Furnaces at **www.rinnai.us.**

Rinnai.

Rinnai America Corporation • 103 International Drive, Peachtree City, GA 30269
Toll-Free: 1-800-621-9419 • Phone: 678-829-1700 • www.rinnai.us
©2013 Rinnai America Corporation. Rinnai is continually updating and improving products; therefore, specifications are subject

© 2013 Rinnai America Corporation

100000354
10/2013